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# TCMC SCHIFF FAMILY NICU RENOVATION

## Tri-City Medical Center

4002 Vista Way  
Oceanside, California 92056

### SPECIFICATIONS

SA PROJECT NO. 01549.01

NOVEMBER 13, 2015



REVIEWED IN ACCORDANCE WITH  
THE REQUIREMENTS OF T24, CCR

APPROVED

APR 05 2017

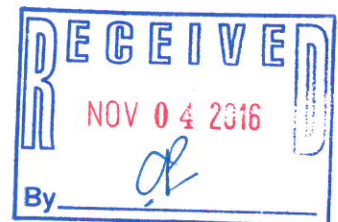
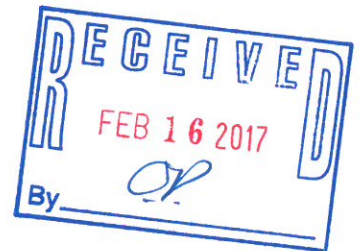
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SEALS PAGES

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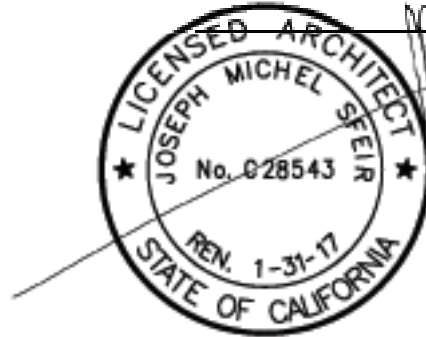
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END OF SEALS PAGE

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TCMC SCHIFF FAMILY NICU RENOVATION  
TRI-CITY MEDICAL CENTER  
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**TCMC SCHIFF FAMILY NICU RENOVATION  
TRI-CITY MEDICAL CENTER  
4002 VISTA WAY  
OCEANSIDE, CALIFORNIA 92056**

**SPECIFICATIONS  
NOVEMBER 13, 2015**

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## DIVISION 01 - GENERAL REQUIREMENTS

### SECTION 01 10 00

#### SUMMARY

#### PART 1 GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. Division 01 - General Requirements relates to and expands upon the Conditions of the Contract, including the General Conditions and the Supplementary Conditions, but does not supersede requirements specified in those documents or in the Owner/Contractor Agreement.
- B. Division 01 - General Requirements governs work under all other divisions of the Specifications, including Project Specifications issued under separate cover, and the Drawings.

##### 1.02 PROJECT IDENTIFICATION AND PRINCIPAL ENTITIES

- A. Project Identification and Location:

TCMC Schiff Family NICU Renovation  
Tri-City Medical Center  
4002 Vista Way  
Oceanside, California 92056

- B. Owner: Wherever the word "Owner" is used in this Project Manual, it shall mean:

Tri-City Healthcare District  
4002 Vista Way  
Oceanside, California 92056

- C. Architect: Wherever the word "Architect" is used in this Project Manual, it shall mean:

S F E I R Architects  
1350 Columbia Street, Suite 603  
San Diego, California 92101

- D. General Contractor: Wherever the words "Contractor" or "General Contractor" are used in this Project Manual, they shall mean the contractor who is party to the Owner/Contractor Agreement.

##### 1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. Single Contract: Unless otherwise indicated or specified, all Work indicated on the Drawings and described in the Specifications is to be executed under one prime contract between Owner and General Contractor.
- B. Scope of Work: The Work consists of the renovation and expansion of the existing NICU on the third floor of the TCMC facility.
  - 1. Renovation of Existing NICU: Revise exiting patient layout, redo floor and wall finishes, and re-laminate existing millwork to match new finishes.
  - 2. NICU Expansion:
    - a. Demolition of existing rooms to add a new isolation room and an accessible unisex toilet and all associated MEP systems.

- b. Alter existing clean utility room.
  - c. Convert existing patient rooms into private NICU rooms with new headwalls and all associated MEP systems.
  - d. Replace all existing finishes with new and expanded existing baby security monitoring system.
  - e. Relaminate all existing millwork and add new millwork at new rooms.
- C. The locations of all existing utilities, as indicated on the Drawings, are approximate. General Contractor shall be responsible for verifying location of all underground and above ground utilities indicated on the Architectural, Mechanical, and Electrical Drawings prior to construction. Any damage to these utilities shall be the Contractor's responsibility and they shall be repaired at no cost to the Owner.
- D. Failure to Visit Site: Will not relieve Contractor from necessity of furnishing materials or performing work that may be required to complete the Work in accordance with Drawings and Specifications without additional cost to Owner.

#### 1.04 WORK BY OWNER OR UNDER SEPARATE CONTRACT

- A. Work by Others to be Executed During or After Completion of this Contract:
- 1. Remediation of Hazardous Materials: No information is available regarding possible hazardous materials in the structures designated for demolition or the areas designated for remodeling. If hazardous materials, such as asbestos or lead-based paints, are encountered, remediation of such materials will be performed by others under separate contract to the Owner. Immediately notify Owner if such materials are observed before or during demolition operations. Coordinate with Owner to reschedule demolition and construction work to be completed after hazardous material remediation is accomplished.
  - 2. Other items indicated to be by Owner, OFOI, or not in contract (N.I.C.) on Drawings.

#### 1.05 COORDINATION WITH OCCUPANTS

- A. Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
- 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
    - a. Emergency Exits: Maintain all required fire exits from existing building at all times existing building is occupied during construction process.
    - b. Exit Doors, Stairways and Discharge Areas: Acceptable to local code authority.
  - 2. Take precautions to allow for continued medical center operations including employee and public access.
  - 3. Related Requirements: See Section 01 35 16 Alteration Project Procedures.
- B. Disruptive Operations: Noisy and disruptive operations (such use of jack hammers and other noisy equipment) shall not be allowed within existing building without prior authorization by the Owner.
- 1. Schedule and coordinate such operations with Owner so that they occur at least disruptive times.
  - 2. Upon notification from Owner, cease operations which are, in opinion of Owner, disruptive to occupants.

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
  - 3. In general outages shall be scheduled at times when the building is not being utilized by occupants.
- D. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- E. Construction Parking: Parking for construction labor on site shall be coordinated with the Owner.
- F. No smoking or use of tobacco products anywhere on Owner's property shall be allowed.

#### 1.06 USE OF SITE

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits and as defined at the Pre-construction Conference.
- B. Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of building or Project site beyond areas in which the Work is indicated.
  - 1. Owner Occupancy: Restrict access to extent required to allow for on-going occupancy of portions of the building outside the area of work.
  - 2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
  - 1. Related Requirements:
    - a. Section 01 35 16 Alteration Project Procedures.
    - b. Section 01 50 00 Temporary Facilities and Controls.
- D. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours, Monday through Friday, unless specifically authorized by the Owner's Representative.

#### 1.07 WORK SEQUENCE AND CONSTRUCTION PHASING

- A. Sequencing of Construction Plan: Before start of construction on site, submit three copies of construction plan regarding access to work; use of site; and scheduling and phasing of new, demolition and renovation work for acceptance by Owner and Architect. After acceptance of plan, construction sequencing shall comply with accepted plan unless deviations are accepted in writing.
  - 1. No work may commence until Notice to Proceed is provided by the Owner.

## 1.08 PROJECT MANUAL FORMATS AND CONVENTIONS

- A. MasterFormat: This Project Manual is organized on the basis of the 2014 Update to the Construction Specifications Institute (CSI) MasterFormat.
  - 1. The system of groups, subgroups and Divisions are listed in the Table of Contents of this Project Manual. It consists of 50 Divisions, Division 00 through Division 49, some of which are not used or are reserved for future expansion of the MasterFormat.
  
- B. Specification Language: These Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences.
  - 1. Omissions of words or phrases such as "the contractor shall", "in conformity therewith", "shall be", "as noted on the Drawings", "a", "the", are intentional.
  - 2. Supply omitted words or phrases by inference.
  - 3. Supply words "shall be" or "shall" by inference when colon is used within sentences or phrases.
  - 4. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION

## SECTION 01 22 00

### UNIT PRICES

#### PART 1 GENERAL

##### 1.01 GENERAL

- A. Quantities indicated on the Drawings or extra quantities specified shall be included in the Contractor's Base Bid. For ADDING or DEDUCTING from Base Bid quantities, the unit prices described in this section will be applied. The Contractor will be notified in writing of the quantities applicable to each unit price and Contract Price will be adjusted accordingly by change order.
- B. All unit prices shall include all labor, materials, equipment, services, delivery to the Project, overhead, profit, insurance and all other incidental expenses to complete the work specified. All work covered by unit prices shall be performed in accordance with requirements of the applicable sections of the specifications.

##### 1.02 UNIT PRICES

- A. Unit Price for Vapor Emission Control Treatment of Floor Slabs: See Section 09 05 61 Common Work Results for Flooring Preparation.
  - 1. Unit of Measure: Square foot of floor slab area treated.
  - 2. Bidding Requirements: Bidders shall indicate unit price for specified vapor emission control treatment on their bid forms.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION





## SECTION 01 25 00

### SUBSTITUTION PROCEDURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Administrative and procedural requirements for consideration of requests for substitution during the construction phase of the Project.
  - 2. Product substitution procedures.
  - 3. Execution substitution procedures.
- B. Related Requirements:
  - 1. General Conditions.
  - 2. Product Requirements: Section 01 60 00.

##### 1.02 LIMITATIONS ON SUBSTITUTIONS

- A. During Procurement Phase: Comply with Instructions to Bidders.
- B. During Construction Phase: Requests for substitutions of products will be considered only within 35 days after date of Owner-Contractor Agreement. Other requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.
- C. Substitutions:
  - 1. Will not be considered when indicated on shop drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
  - 2. Do not order or install substitute products without written acceptance.
  - 3. Only one request for substitution for each product will be considered. When substitution is not accepted provide specified product.
  - 4. Architect will determine acceptability of substitutions.
- D. Value Engineering: For "value engineering" or similar cost or time reduction proposals that would result in changes to the Drawings and Specifications, the Contractor shall follow procedures specified herein and any and all such changes are to be submitted in "Substitution Approval Request Form" provided by Architect upon request of the Contractor.

##### 1.03 CONTRACTOR REPRESENTATION

- A. Request for Product Substitution: Representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product:
  - 1. Contractor will provide same warranty for substitution as for specified product.
  - 2. Contractor will coordinate installation of accepted substitute, making such changes as may be required for work to be complete in all respects.
  - 3. Contractor waives claims for additional costs related to substitution which may later become apparent.
- B. Replacement: If substituted products do not meet or exceed above requirements, whether before, during, or after incorporated into work, Contractor shall, at no additional cost to Owner, replace substituted products with products originally specified.

#### 1.04 SUBSTITUTION REQUEST SUBMITTAL PROCEDURES

- A. Submittal : Submit two copies of each request. Submit separate request for each substitution.
  - 1. Identify products by Specifications section and article numbers.
  - 2. Provide manufacturer's name and address, trade name of products, and model or catalog number.
  - 3. List fabricators and suppliers as appropriate.
  
- B. Documentation: Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents:
  - 1. Attach Product Data as specified in Section 01 33 00.
  - 2. Give itemized comparison of proposed substitution with specified product, listing variation, and reference to specification section and article numbers.
  - 3. Give quality and performance comparison between proposed substitution and specified product.
  - 4. List availability of maintenance services and replacement materials.
  - 5. State effect of substitution on construction schedule, and changes required in other work or products.
  - 6. Reference UL Fire Resistance Directory design number if applicable.
  
- C. Architect: Will review Contractor's requests for substitutions with reasonable promptness.
  - 1. If accepted by Architect, products proposed for substitution will be accepted subject to modifications by manufacturer, if necessary, to meet detailed requirements of Drawings and Specifications.
  - 2. Architect will not make exhaustive attempt to determine that products proposed for substitution are equal to, or can be modified in order to be equal to specified products.
  
- D. Architect's Acceptance: Architect will notify Contractor, in writing, of decision to accept or reject requested substitution.
  
- E. For Accepted Products: Submit shop drawings, product data, and samples in accordance with Section 01 33 00.

**PART 2 PRODUCTS** – Not Used

**PART 3 EXECUTION** – Not Used

END OF SECTION

## SECTION 01 26 00

### CONTRACT MODIFICATION PROCEDURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This section specified administrative and procedural requirements necessary for handling and processing Contract modifications.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Division 01 Section "Submittal Requirements" for requirements for the Contractor's Construction Schedule.
  - 2. Division 01 Section "Payment Procedures" for administrative procedures governing application for payment.

##### 1.02 MINOR CHANGES IN THE WORK

- A. Supplemental Instructions authorizing minor change in the Work, not involving an adjustment to the Contract Sum or Contract Time, may be issued by the Architect on an AIA form G711, Architect Supplemental Instructions.

##### 1.03 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Request: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Owner, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
  - 1. Proposal requests issued by the Owner are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.
  - 2. Unless otherwise indicated in the proposal request, within 30 days of receipt of the proposal request, submit to the Architect and the Owner for review an estimate of cost necessary to execute the proposed change.
    - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantial quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Owner and Architect.
  - 1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
  - 2. Include a list of the quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Comply with requirements in Section "Products Substitutions" if the proposed change in the work requires the substitutions of one product or system for a product or system specified.

C. Proposal Request Form: Use forms approved by the Owner for Change Order Proposals.

1.04 CHANGE ORDER PROCEDURES:

- A. In addition to the procedure and information stated in the section, herein before: the Contractor shall follow Change Order procedures and information as stated in the General Conditions of the Contract and on the Bid Form.
- B. Upon the Owner's approval of a Change Order proposal Request, the owner will issue a Change Order for signatures of the Owner, Contractor, and Architect.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION

**SECTION 01 29 00**  
**PAYMENT PROCEDURES**

**PART 1 GENERAL**

1.01 SUMMARY

- A. This Section specifies administrative, and procedural requirements governing the Contractor's Applications for Payment.
- B. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

1.02 COORDINATION

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. Contractor's construction schedule.
    - b. Application for Payment form.
    - c. List of subcontractors.
    - d. Schedule of allowances.
    - e. List of products.
    - f. List of principal suppliers and fabricators.
    - g. Schedule of submittals.
  - 2. Submit the Schedule of Values- Schedule Amounts to the Owner at the earliest feasible date, but in no case later than 7 days before the date schedule for submittal of the initial Application for payment.

1.03 SCHEDULE OF VALUES

- A. Identification; Include the following Project identification on the Schedule of Values:
  - 1. Name of Owner.
  - 2. Project name and location.
  - 3. Name of Architect.
  - 4. Project number.
  - 5. Contractor's name and address.
  - 6. Date of submittal.
- B. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed;
  - 1. Generic name.
  - 2. Relate Specification Section.
  - 3. Name OF subcontractor.
  - 4. Name of manufacturer or fabricator.
  - 5. Name of supplier.
  - 6. Change Orders (numbers) that have affected value.
  - 7. Dollar value.
  - 8. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

- C. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress evaluation of Applications for Payment and progress report. Break principle subcontract amounts down into several line items.
- D. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
- E. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the work.
- F. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually and Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be completed including its total cost and proportionate share of general overhead and profit margin.
- G. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
- H. Schedule Updating: Update and resubmit the Schedule of Values when change Orders result in a change in the Contract sum.

#### 1.04 APPLICATIONS FOR PAYMENT:

- A. Each Application for payment shall be consistent with previous applications and payments and certified by the Architect and paid for by the Owner.
  - 1. The initial Application for payment, the Application for payment at time of Substantial Completion, and the final Application for Payment involved additional requirements.
- B. Payment Application Times: The date for each progress payment is the first construction progress meeting of each month. The period of construction Work covered by each Application for Payment is the period ending at the last day of the month prior to the date for each progress payment and starting the day following the end of the preceding period.
- C. Payment Applications Forms: Use AIA Document G702 and G703.
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedule if revisions have been made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit 5 executed copies of each Application for payment to the Owner and Architect at the first of the bi-weekly Construction Progress Meeting. This meeting will extend into preview and acceptance by all required parties of the Contractor's application of payment.
  - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

- F. Waivers of Mechanics Lien: With each Application for Payment submit waivers of Mechanic liens from subcontractors or sub-subcontractors and supplier for the construction period covered by the pervious application.
  - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit final or full waivers.
  
- G. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 1. Wavier Delays: Submit each Application for Payment with the Contractors Wavier of Mechanics lien for the period of construction covered by the application.
  - 2. Submit final Application for payment with or proceeded by final wavier from every entity involved with performance with Work covered by the Application who could lawfully be entitled to a lien.
  - 3. Waiver Forms: Submit Wavier of lien of forms, and executed in a manner, acceptable to Owner.
  
- H. Initial Application for payment: Administrative action and submittal that must precede or coincide with submittal of the first Application for Payment include but not limited to the following:
  - 1. List of subcontractors and their agreements with the Contractor.
  - 2. List of principle suppliers and fabricators.
  - 3. Schedule of Values.
  - 4. Contractors Construction Schedule (preliminary if not final).
  - 5. Schedule of principle products.
  - 6. Submittal Schedule (preliminary if not final).
  - 7. List of Contractor's staff assignments.
  - 8. List of Contractor's principle consultants.
  - 9. Copies of building permits.
  - 10. Copies of authorization and licenses from governing authorities for performance of the Work.
  - 11. Certificates of insurance and insurance policies.
  - 12. Data needed to acquire Owner's insurance.
  
- I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, on the entire project, submit an Application for Payment.
  
- J. Administrative actions and submittals that shall precede or coincide with this application include:
  - 1. Occupancy permits and similar approvals.
  - 2. Warranties (guarantees) and maintenance agreements.
  - 3. Test/ adjust / balance records.
  - 4. Maintenance instructions.
  - 5. Changeover information related to owner's occupancy, use, operation and maintenance.
  - 6. Final cleaning.
  - 7. Application for reduction of retainage, and consent of surety.
  - 8. Advice on shifting insurance coverage.
  - 9. Final progress photographs.
  - 10. List of delayed work, recognized as exceptions to Architect's Certificate of Substantial Completion.
  
- K. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment Application for Payment include the following:
  - 1. Completion of project closeout requirements.
  - 2. Completion of items specified for completion after Substantial Completion.
  - 3. Assurance that unsettled claims will be settled.
  - 4. Assurances that work not complete and accepted will complete without undo delay.
  - 5. Transmittal of required Project Construction Records to the Owner.

6. Proof that taxes, fees and similar obligations have been paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish and similar elements.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION



## SECTION 01 31 13

### PROJECT COORDINATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This section specified administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
  - 1. Coordination.
  - 2. Administrative and Supervisory personnel.
  - 3. General installation provision.
  - 4. Cleaning and protection.
  - 5. Time and Manner.
- B. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings."
  - 1. Requirements for the Contractor's Construction Schedule are included in Section "Submittals."

##### 1.02 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
  - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule Construction activities in the sequence to obtain the best results.
  - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

##### 1.03 COORDINATION

- A. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required Administrative Procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to the following:
  - 1. Preparation of Schedules.
  - 2. Installation and removal of temporary facilities.
  - 3. Delivery and processing of submittals.
  - 4. Progress Meetings.
  - 5. Project closeout activities.
- C. Conservation: Coordinate Construction activities to ensure that operations are carried out with considerations given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

#### PART 2 PRODUCTS - Not Used

## **PART 3 EXECUTION**

### **3.01 GENERAL INSTALLATION PROVISIONS**

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damage and defective items.

### **3.02 GENERAL INSTALLATION PROVISIONS:**

- A. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- B. Visual effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- C. Recheck measurements and dimensions, before starting each installation.
- D. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- E. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized with the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for the final decision.

### **3.03 CLEANING AND PROTECTION**

- A. Cleaning and Maintenance:
  - 1. Special cleaning requirements for specific units of Work are included in the appropriate sections of the specifications. Final cleaning is required under section 01700.
  - 2. The Contractor shall remove and dispose of all waste materials and rubbish due to all construction operations under the contract.
- B. Protection: In addition to the General Conditions, the Contractor or alteration work. Use only new materials in construction of all protection. If wood is called for, it shall be fire retardant treated wood if used within the interior of the building. No cutting of materials shall be done within occupied spaces.

### **3.04 OWNER OCCUPANCY:**

- A. Partial Owner Occupancy: The Owner reserves the right to place and install equipment as necessary in completed areas of the building and to occupy such completed areas prior to substantial completion, provided that such occupancy does not substantially interfere with completion of the work. Such placing of equipment and partial occupancy shall not constitute acceptance of the work or any part of the work.

END OF SECTION

## SECTION 01 31 19

### PROJECT MEETINGS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
  - 1. Pre-Construction Conference.
  - 2. Pre-Installation Conferences.
  - 3. Progress Meetings.
- B. Construction schedules are specified in another Division-01 Section.

##### 1.02 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 5 days after the notice to proceed and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Architect and their consultants, the Prime Contractors and their superintendent, major subcontractors, manufactures, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including but not limited to such topics as:
  - 1. Tentative construction schedule.
  - 2. Critical Work sequencing.
  - 3. Designation of responsible personnel.
  - 4. Procedures for processing filed decisions and Change Orders.
  - 5. Procedures for processing Applications for Payment.
  - 6. Distribution of Contract Documents.
  - 7. Submittal of Shop Drawings, Product Data and Samples.
  - 8. Preparation of record documents.
  - 9. Use of the premises.
  - 10. Office, work and storage areas.
  - 11. Equipment deliveries and priorities.
  - 12. Safety procedure
  - 13. First aid.
  - 14. Security
  - 15. Housekeeping.
  - 16. Working Hours.

##### 1.03 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction and as specified herein. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of Schedule meeting dates.

- B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference.
- C. Do not proceed if the conference cannot be successfully concluded. Indicate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

#### 1.04 PROGRESS MEETINGS

- A. Conduct progress meetings at Project site bi-weekly. Coordinate dates of meeting with preparation of the payment request.
- B. Attendees: In addition to representative of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current of the Project.
  - 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
  - 2. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule to the Owner and Architect.

**PART 2 PRODUCTS** – Not used

**PART 3 EXECUTION** – Not used

END OF SECTION

## SECTION 01 33 00

### SUBMITTAL PROCEDURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
  - 1. Contractor's construction schedule.
  - 2. Submittal schedule.
  - 3. Construction progress photographs.
  - 4. Shop Drawings.
  - 5. Product Data.
  - 6. Samples.
- B. Administrative Submittals: T=Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
  - 1. Permits.
  - 2. Applications for payment.
  - 3. Performance and payment bonds.
  - 4. Insurance certificates.
  - 5. List of Subcontractors.
- C. The schedule of Values submittal is included in Section "Applications fro Payment.'
- D. Inspection and test reports are included in Section "Quality Control Services."

##### 1.02 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delays.
  - 1. Coordinate each submittal with fabricate, purchasing, testing, delivery, other submittals and related activities that require sequential activities.
  - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals constructed for coordination.
    - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing: Allow sufficient review time so that installation will not be delayed as result of the time required to process submittals, including time for resubmittals.
  - 1. Allow two weeks for initial review. Allow Additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the contractor when a submittal being processed must be delayed for coordination.
  - 2. If an intermediate submittal is necessary, process the same as initial submittal.
  - 3. Allow two weeks for reprocessing each submittal.
  - 4. 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.

- C. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings and product Data to record the Contractor's review and approval markings and the action taken for accuracy, completeness and compliance with the Contract Documents. Submittals without evidence of the Contractor's review and approval will be returned for resubmission.
  2. Include the following information on the label for processing and recording action taken.
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name manufacturer.
    - h. Number and title of appropriate Specifications Section.
    - i. Drawings number and detail references, as appropriate.
- D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form with copy of transmittal to Owner. Submittal received from sources other than the Contractor will be returned without action.
1. On the transmittal Record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirement, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

### 1.03 CONTRACTORS' CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: The General Contractor shall prepare a fully developed, horizontal bar-chart type contractors' construction schedule. Submit within 10 days of the date of the notice to proceed.
1. Provide a separate time bar for each significant construction activity including the related contracts activities. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicate in the "Schedule of Values."
  2. Within each time bar indicated estimate completion percentage in 10 percent increments. As Work progress, place a contrasting mark in each bar to indicate Actual Completion.
  3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
  4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
  5. Coordinate the Contractors' construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedule.
  6. Indicate completion in advance of the date established for schedule Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, related Prime Contractor, subcontractors, and other parties require to comply with schedule dates. Post copies in the project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

- C. Schedule Updating: Revise and reissue the schedule after each meeting or activity, where revisions have been recognized or made.

#### 1.04 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractors' construction schedule, each Prime Contractor shall prepare a complete schedule of submittals. Submit the schedule within 10 days from the Pre-Construction Conference.
- B. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
- C. Prepare the schedule in chronological order; include submittals required during the first 30 days of Construction. Provide the following information:
  - 1. Schedule date for the first submittal.
  - 2. Related Section number.
  - 3. Submittal category.
  - 4. Name of subcontractor.
  - 5. Description of the part of the work covered.
  - 6. Scheduled date for resubmittal.
  - 7. Scheduled date for the Architect's final release or approval.
- D. Distribution: Following response to initial submittal, print and distribute copies to the Architect's, Owner, subcontractors, and other parties required to comply with submittal date indicated. Post copies in the Project meeting room and file in office.
  - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- E. Schedule Updating: Revise and reissue the schedule after each meeting or activities, where revisions have been recognized or made.

#### 1.05 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. 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 considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
  - 1. Dimensions.
  - 2. Identification of products and materials included.
  - 3. Completion with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established field measurement.
- C. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2"x11" but not larger than 30" x 42"
- D. Initial Submittal: To Architect submit one correctable translucent reproducible print and one blue- or black-line print for the Architect's review; the reproducible print will be returned.

- E. Final Submittal: To Architect a minimum of blue- or black-line prints; submit 8 prints where required for maintenance manuals. 5 prints will be retained; the remainder will be returned.
  - 1. One of the prints returned shall be marked-up and maintained as a "Record Document".
  - 2. Do not Shop drawings without an appropriate final stamp indicating action taken in connection with construction.

#### 1.06 PRODUCT DATA

- A. Collect product Data into a single submittal for each element of construction or system. Product Data included printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as ' Shop Drawings".
- B. Mark each copy to show applicable choices and options. Where printed Product Data included information on several products, some of which are not required. Mark copies to indicate the applicable information. Include the following information:
  - 1. Manufacturer's printed recommendations.
  - 2. Compliance with recognized trade association standards.
  - 3. Compliance with recognized testing agency standards.
  - 4. Application of testing agency labels and seals.
  - 5. Notation of dimensions verified by field measurement.
  - 6. Notation of coordination requirements.
- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- D. Preliminary Submittal: To Architect submit a preliminary single-copy of product Data where selection of options is required.
- E. Submittals: To Architect submit a minimum of 7 copies of each required submittal; submit 8 copies where required for maintenance manuals. The Architect will retain 5 copies. And will return the other marked with action taken and corrections or modifications required.
- F. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and other required for performance of construction activities. Show distribution on transmittal form with copy being sent to Architect and Owner.

#### 1.07 SAMPLES

- A. Submit to Architect full-size, fully fabricate Sample cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricate components, cuts or containers of materials; color ranges sets, and swatches showing color, texture and pattern.
- B. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:
  - 1. Generic description of the Sample.
  - 2. Sample source.
  - 3. Product name or name of manufacturer.
  - 4. Compliance with recognized standards.
  - 5. Availability and delivery time.



- C. Submit to Architect Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristic between the final submittal and the actual component as delivered and installed.
  - 1. Where variation in color, pattern, texture or other characteristic are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
  - 2. Refer to other Specification sections for requirements for Samples that illustrate workmanship. Fabrication techniques, details of assembly, connections, operation and similar construction characteristic.
  - 3. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal of Sample submittals.
- D. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
  - 1. Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.
- E. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
  - 1. Maintain sets of Samples, as returned, at the Project site, for Quality comparisons throughout the course of construction.
  - 2. Unless no completion with Contract Document provisions is observed, the submittal may serve as the final submittal.
  - 3. Sample sets may be used to obtain final acceptance of the construction associate with each set.
- F. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, supplies, installers, and others as required for performance of the work. Show distribution on transmittal form sent to Architect And Owner.
- G. Filed Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finish coats, or finishing materials and to establish the standard by which the Work will be judge.
  - 1. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

#### 1.08 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, here action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and promptly.
  - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken.
  - 1. Final Unrestricted Release: Where submittals are marked "No Exception Taken," that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
  - 2. Final-but-Restricted Release: When submittals are marked "Make Corrections Noted," that part of the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend upon that compliance.

3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
4. Do not permit submittals marked "Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
5. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION

## SECTION 01 35 16

### ALTERATION PROJECT PROCEDURES

#### PART 1 GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Coordinate work of trades and schedule elements of alterations and renovation work by procedures and methods to expedite completion of the Work.
- B. In addition to demolition specified in Section 02 41 19 and that specifically shown, cut, move and remove items as necessary to provide access or to allow alterations and new work to proceed. Include such items as:
  - 1. Repair or removal of hazardous or unsanitary conditions.
  - 2. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring.
  - 3. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals and deteriorated concrete.
  - 4. Cleaning of surfaces, and removal of surface finishes, as needed to install new work and finishes.
- C. Patch, repair and refinish existing items to remain, to the specified conditions for each material, with a workmanlike transition to adjacent new items of construction.
- D. Coordination of power outages and major interruptions of progress of construction work with Owner.

##### 1.02 RELATED REQUIREMENTS

- A. Materials for Renovation Work: Specifications in Divisions 02 through 31.
- B. Use of Premises and Work Restrictions: Section 01 10 00 Summary.
- C. Cutting and Patching of New or Existing Work During Construction: Section 01 73 29 Cutting and Patching.
- D. Use of Existing Utilities: Section 01 50 00 Temporary Facilities and Controls.
- E. Cleaning During Construction: Section 01 50 00 Temporary Facilities and Controls.
- F. Selective Demolition: Section 02 41 19.
- G. Removal and Salvage of Construction Materials: Section 02 42 00.

##### 1.03 ALTERATIONS, CUTTING AND PROTECTION

- A. Assign the work of moving, removal, cutting and patching to trades qualified to perform the work in a manner to cause least damage to each type of work, and provide means of returning surfaces to appearance of new work.

- B. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work.
  - 1. Cut finish surfaces such as masonry, tile, stone flooring, plaster or metals by methods to terminate surfaces in a straight line at a natural point of division.
- C. Protect existing finishes, equipment and, adjacent work that is scheduled to remain, from damage.
  - 1. Protect existing and new work from weather and extremes of temperature.
    - a. Maintain existing interior work above 60 degrees F.
    - b. Provide weather protection, waterproofing, heat and humidity control as needed to prevent damage to remaining existing work and to new work.
- D. Temporary Enclosures:
  - 1. Provide temporary, dustproof enclosures to separate work areas from existing building and from areas occupied by Owner.

#### 1.04 COORDINATION WITH OWNER'S USE OF THE FACILITY

- A. General: Coordinate construction phasing with operation of Owner's existing facility. The Owner intends to occupy portions of the existing building throughout construction.
  - 1. Establish effective communications with the Owner regarding Owner's operation and moving schedule. Give as much advance notice as possible, in addition to the minimums specified, for construction activities that will affect Owner's operations.
- B. Utility Interruptions: Coordinate with Owner. Notify Owner 48 hours in advance of all necessary utility interruptions, including those scheduled for off hours.
- C. Sequence of Construction and Remodeling:
  - 1. Coordination: Coordinate construction schedule with Owner's requirements.

## PART 2 PRODUCTS

#### 2.01 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

- A. General Requirements that Work be Complete:
  - 1. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work.
    - a. Generally Contract Documents will not define products or standards of workmanship present in existing construction; Contractor shall determine products by inspection and any necessary testing, and workmanship by use of the existing as a sample of comparison.
  - 2. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed as necessary to make work complete and consistent.

## PART 3 EXECUTION

#### 3.01 LAYING OUT WORK

- A. Verify dimensions and elevations indicated in layout of existing work. Refer discrepancies between Drawings, Specifications and existing conditions to Architect for adjustment before work affected is performed. Failure to make such notification shall place responsibility upon Contractor to carry out work in satisfactory, workmanlike manner.

- B. The Contractor shall be held responsible for the location and elevation of the construction contemplated by the Construction Documents.
- C. Prior to commencing work, carefully compare and check Architectural, Structural, Mechanical and Electrical Drawings, each with the other that in any way affects the location or elevation of the work to be executed, and should any discrepancy be found, immediately report the same to the Architect for verification and adjustment.

### 3.02 LOCATION OF EQUIPMENT AND PIPING

- A. Drawings showing location of equipment, piping, ductwork, etc. are diagrammatic and job conditions shall not always duplicate conditions shown. When this situation occurs, it shall be brought to the Architect's attention immediately and the relocation determined in a joint conference.

### 3.03 PATCHING EXISTING FACILITIES

- A. Existing structures, facilities, etc. that are damaged or removed due to required construction work, shall be patched, repaired or replaced, and be left in their original state of repair by the Contractor, to satisfaction of the Architect.

### 3.04 INTEGRATING EXISTING WORK

- A. Protect existing improvements from damage.
- B. Contractor's operations shall be confined to the immediate vicinity of the new work and shall not in any way interfere with or obstruct the ingress or egress to and from adjacent facilities.
- C. Where new work is to be connected to existing work, special care shall be exercised not to disturb or damage the existing work more than necessary. All damaged work shall be replaced, repaired and restored to its original condition at no cost to the Owner.

### 3.05 ADJUSTING

- A. Where partitions are removed, patch floors, walls and ceilings with finish materials to match existing.
  - 1. Where removal of partitions results in adjacent spaces becoming one, rework floors and ceilings to provide smooth planes without breaks, steps or bulkheads.
  - 2. Where extreme change of plane occurs, request instructions from Architect as to method of making transition.
- B. Trim and refinish existing doors as necessary to clear new floors.

### 3.06 DAMAGED SURFACES

- A. Patch and replace any portion of an existing finished surface which is found to be damaged, lifted, discolored, or shows other imperfections, with matching material.
  - 1. Provide adequate support of substrate prior to patching the finish.
  - 2. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
  - 3. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.

### 3.07 TRANSITION FROM EXISTING TO NEW WORK

- A. When new work abuts or finishes flush with existing work, make a smooth and workmanlike transition. Patch work shall match existing adjacent work in texture and appearance so that the patch or transition is invisible at a distance of five feet.
  - 1. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

### 3.08 DUST CONTROL

- A. Precaution shall be exercised at all times to control dust created as a result of any operations during the construction period. If serious problems arise due to air borne dust, and when directed by Architect, operations causing such problems shall be temporarily discontinued and necessary steps taken to control the dust.

### 3.09 FIRE PROTECTION

- A. Maintain good housekeeping practices to reduce the risk of fire damage and injury to workmen. All scrap materials, rubbish and trash shall be removed daily from in and about the work area and shall not be permitted to be scattered to adjacent areas.
- B. Suitable storage space shall be provided outside the immediate building area for storing flammable materials and paints; no storage will be permitted in the building. Excess flammable liquids being used inside the building shall be kept in closed metal container and removed from the building during unused periods.
- C. A fire extinguisher shall be available at each location where cutting or welding is being performed. Where electric or gas welding or cutting work is done, interposed shields of incombustible material shall be used to protect against fire damage due to sparks and hot metal. When temporary heating devices are used, a watchman shall be present to cover periods when other workmen are not on the premises.
- D. Provide fire extinguishers in accordance with the recommendations of NFPA Bulletins Nos. 10 and 241. However, in all cases a minimum of four fire extinguishers shall be available for each building.

### 3.10 CLEANING

- A. Perform periodic and final cleaning as specified in Section 01 74 00, 01 50 00 and as follows:
  - 1. Clean Owner-occupied areas where construction or remodeling is occurring, daily.
  - 2. Clean areas of heavy dust production daily.
  - 3. Clean spillage and overspray immediately.
- B. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.
- C. At completion of work in each area, provide final cleaning and return space to a condition suitable for use by Owner.

END OF SECTION

## SECTION 01 42 00

### REFERENCES

#### PART 1 GENERAL

##### 1.01 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions.
- B. Indicated: The term “ indicated “ refers to graphic representations, notes, or schedule on the Drawings, other paragraphs or schedule in the Specifications, and similar requirements in the Contract Documents. Where terms such as “ shown “, “ noted”, “scheduled,” and “specified” are used it is to help the reader locate the reference; no limitations on location is intended.
- C. Directed: Terms such as “directed,” “requested,” authorized,” “selected”, “approved,” “required,” and “permitted” mean “directed by the Architect,” requested by the Architect, and similar phrases.
- D. Approve: The term “approved,” where used in conjunction with the Architect’s action on the Contractor’s submittals, applications, and requirements, is limited to the Architect’s duties and responsibilities as stated in General and Supplementary Conditions.
- E. Regulation: The term “Regulations” included laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term “furnish” is used to mean “ supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.”
- G. Install: The term “install” is used to describe operations at project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”
- H. Provide: The term “provide “ means “to furnish and install, complete and ready for the intended use.”
- I. Installer: An “installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term “experienced” when used with the term “Installer” means having a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
- J. Trades: Use of titles such as “ carpentry “ is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “ carpenter.” It also does not imply that requirements specified apply exclusively to tradesperson of the corresponding generic name.
- K. Assignment of Specialists: Certain Sections of the Specifications require that specified construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and

assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with Local trade union jurisdictional settlements and conventions.
- L. Project Site is the space available to the Contractor for Performance of construction activities, either exclusively or in conjunction with others performing other work as part of the project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.
- M. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- N. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- O. Approved Equals-Equivalents:
  1. The words "similar and equal to", "or equal", "equivalent" and such other words of similar content and meaning shall for the purposes of this contract be deemed to mean similar and equivalent to one of the named products. For the purpose of this article and for the purpose of the bidding documents, the word "products" shall be deemed to include the words "articles", "materials", "items", "equipment" and "methods". Whenever in the contract documents one or more products are specified, the words "similar and equal to" shall be inserted.
  2. Wherever any product is specified in the contract documents by a reference to the name, trade name, or catalog number of any manufacturer or supplier, the intent is not to limit competition, but to establish a standard of quality which the Architect has determined is necessary for the project. The Contractor may at their option use any product other than that specified in the contract documents provided the same is approved by the Architect in accordance with the acceptable procedures. However no substitutions will be allowed after bidding that changes product type or system type, as specified herein unless otherwise noted.
- P. Nothing in the contract documents shall be construed as representing, expressly or impliedly, that the named product is available or that there is or there is not a product similar and equal to any of the name products and the Contractor shall have and make no claim by reason of the availability of lack of availability of the named product or of a product similar and equal to any named product.

## 1.02 TECHNICAL SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Technical Specification Format: These Technical Specifications are organized into Divisions and Sections on the basis of the 2014 Update to the Construction Specifications Institute (CSI) MasterFormat.
  1. The system of groups, subgroups and Divisions are listed in the Table of Contents of this Project Manual. It consists of 50 Divisions, Division 00 through Division 49, some of which are not used or are reserved for future expansion of the MasterFormat.
- B. Technical Specification Content: This Technical Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
  1. Abbreviated Language: Language used in Technical Specifications and other Contract Documents is the abbreviated type. Implied words and meaning will be appropriately



- interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the Contract Documents so indicates.
2. Specification Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include “prescriptive,” “open generic descriptive,” “compliance with standards,” “performance,” “proprietary,” or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.
  3. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimum or levels of quality, the most stringent requirement is intended and will be enforced.
- C. Contractor’s Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor’s regardless of whether or not it is specifically indicated as such.
1. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or proved. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances). Or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of the requirements. Refer instances of uncertainty to Architect/Engineer for decision before proceeding.
  2. Specialists, Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entitles, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar Conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as “expert “ for the indicated construction processes or operations. Nevertheless. The final responsibility for fulfillment of the entire set or requirements remains with the Contractor.
  3. Trades: Except as otherwise indicated, the use of titles such as “ Carpentry “ in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as “carpenter”), nor specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

### 1.03 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable Construction industry standards have the same force and effects as if bound or copied directly into the Contract Documents. Such Standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
- C. Conflicting Requirements: Where compliance with two or more standards specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
  1. 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. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of documents are needed for performance of a required construction activity, the Contractor shall obtain Copies from the publication source.
  - 2. Although copies of standards needed for enforcement of requirements may be included as part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
  
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade associations, standards generating organization, authority having jurisdiction, or other entity application to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in, most libraries.

#### 1.04 SUBMITTALS

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

**PART 2 PRODUCTS** – Not used

**PART 3 EXECUTION** – Not used

END OF SECTION

## SECTION 01 45 20

### QUALITY CONTROL SERVICES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and test, cover production of standard products as well as customized fabrication and installation procedures.
- E. Inspection, test and related actions specified are not intended to limit the Contractor's control procedures that facilitate compliance with Contract Document requirements.
- F. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

##### 1.02 RESPONSIBILITIES

- A. Testing Agency: The District will employ and pay an independent agency, subject to approval by the Architect, to perform specified quality control services.
- B. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements.
- C. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to.
  - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and test.
  - 2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
  - 3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
  - 4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
  - 5. Security and protection of Samples and test equipment at the Project site.
- D. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction Sections shall cooperate with the Architect

and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

E. Coordination: The Contractor and each agency engaged to perform inspections; tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition to Contractor, each agency shall coordinated activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

F. The Contractor is responsible for scheduling time for inspections, tests, taking samples and similar activities

### 1.03 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service directly to the Architect, in duplicate, with a copy to the Contractor.

B. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

C. Report Data: Written reports of each inspection, test or similar services shall include, but not be limited to:

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 the inspection or test.
6. Designation of the Work and test method.
7. Identification of product and specification Section.
8. Complete inspection or test data.
9. Test results and an interpretation of test results.
10. Ambient conditions at the time of sample taking and testing.
11. Comments or professional opinion as to whether inspection or tested Work complies with Contract Document Requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting.

## **PART 2 PRODUCTS - Not Used**

## **PART 3 EXECUTION**

### 3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damage construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for 'Cutting and Patching.'

- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION



## SECTION 01 50 00

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Temporary utilities.
  - 2. Construction facilities.
  - 3. Temporary construction.
  - 4. Construction aids.
  - 5. Temporary barriers and enclosures.
  - 6. Temporary controls.
- B. Related Requirements:
  - 1. Utility Usage: General Conditions, Article 56.
  - 2. Work Restrictions: Section 01 10 00 Summary.
  - 3. Alteration Project Procedures: Section 01 35 16.

#### PART 2 PRODUCTS - Not Used

#### PART 3 EXECUTION

##### 3.01 TEMPORARY ELECTRICITY AND LIGHTING

- A. Service and Distribution:
  - 1. Contractor may connect to existing electrical power system for source of temporary electricity and lighting. Coordinate location and means of connection with Owner.
  - 2. Provide temporary electrical service and temporary wiring, outlets, lights, etc. as required for construction power and lighting during construction period.
  - 3. Properly ground service and distribution system in accordance with NEC. Provide ground fault interrupters as required by code.
  - 4. Remove temporary electrical service and wiring upon completion of work.
- B. Temporary Power Distribution:
  - 1. Supplement existing system as required. Provide minimum of one double duplex 120V outlet for every 100 lineal feet of temporary loop.
  - 2. Each Contractor: Furnish extension cords necessary to convey electricity from temporary loop outlets to locations of work.
  - 3. Special Power Required for Welders or Other Special Equipment: Provided by contractor requiring such power.
  - 4. Distribution equipment and wiring devices for temporary power and lighting need not be new, however, installation shall conform to safe general practice as required by OSHA.
- C. Temporary Lighting:
  - 1. Provide one light for every interior room regardless of square footage area except closets and pipe chases. In larger rooms, provide one light for every 750 square feet.
  - 2. Each Contractor: Provide plug-in portable lights as required for task lighting.

D. Use of Permanent Systems:

1. Existing permanent system and, where applicable, new or modified components of permanent system installed under this Contract, may be used as necessary for power and light.
2. Be responsible for any damage to permanent wiring or fixtures as result of temporary use.
3. Permanent branch circuit wiring may be used to supply pigtail lights if protected by properly sized circuit breaker or fuse. Do not use permanent receptacles for construction power. Replace receptacles and device plates showing wear or abuse.
4. Provide lamps necessary to temporarily light work in permanently installed fixtures.
5. Clean permanently installed light fixtures that are used for temporary lighting during construction using methods and materials recommended by the manufacturer.
6. Remove lamps used temporarily in permanent fixtures and replace with new lamps at completion of work.

### 3.02 TEMPORARY HEAT, VENTILATION AND ENCLOSURES

- A. Temporary Heat: Provide temporary heat necessary for execution of Work. Install, maintain and operate temporary heating apparatus in manner to facilitate work, to comply with ambient environmental limitations for installation of new products and materials required by the specifications and manufacturer's installation instructions, to enable work to continue, and to ensure finished work will not be damaged by cold or freezing.
- B. Enclosures: Provide temporary enclosures necessary for holding temporary heat for masonry and concrete work, and for thawing frozen ground.
- C. Use of Permanent System:
1. In using permanent heating system, assume complete responsibility for its proper operation and for any damage that may occur to heating apparatus or any phase of work except such wear and tear that would ordinarily result from normal usage.
  2. At completion and before work is accepted by Owner, clean air vents and coils, clean cleanable filters and replace replacement air filters.
  3. If permanent heating system is used during construction, Contractor shall remain responsible for full mechanical guarantee from date of Notice of Acceptance of total Project by Owner.

### 3.03 TEMPORARY WATER

- A. Existing System: Contractor may connect to existing water distribution system for source of temporary water.
1. Coordinate location and means of connection with Owner.
  2. Provide temporary connection, plumbing, piping, etc. necessary to convey same to places needed.

### 3.04 TEMPORARY SANITARY FACILITIES

- A. Temporary Toilet Facilities: Provide and maintain, in neat and sanitary condition, adequate temporary self-contained chemical toilet facilities for use of employees engaged on work, in compliance with requirements of applicable codes, regulations, laws and ordinances. Locate units within fenced/screened area.
1. Toilets in existing buildings shall not be used.



### 3.05 FIELD OFFICE AND OTHER TEMPORARY STRUCTURES

- A. Field Office: Provide and maintain suitable temporary field office.
  - 1. Telephone and Fax Service: Install telephone with answering machine and fax machine in field office. Pay for installation, maintenance, removal and other charges for use of telephone.
    - a. Make office and telephone/fax machine available for use by Owner and Architect.
  - 2. Photocopier: Install at least one photocopying machine in field office.
  - 3. Maintain current set of Drawings at site and make available for use by Architect.
- B. Temporary Structures: Provide temporary structures and storage areas as required.
  - 1. Remove offices and other temporary structures from site upon completion of work.
  - 2. Locate on site in orderly manner as coordinated with Owner.

### 3.06 TEMPORARY PROTECTIVE FACILITIES

- A. Provide and maintain protective devices and facilities for protection of public and general protection of workmen on project.
  - 1. Provide warning signs against hazards created by such features of construction as protruding nails, hoists, well holes, window openings, stairways and falling materials.
  - 2. Provide and maintain fire extinguishers and active fire hydrants where required. Maintain fire lanes to hydrants and other equipment as necessary for proper fire protection during construction.
  - 3. Provide temporary walks, roadways, trench covers, barricades, bulkheads, railings, danger lights and signals, etc. required for work by applicable safety laws and building codes.
  - 4. Maintain temporary protective facilities in good condition throughout term of work. Remove at completion of work. Repair and replace work damaged thereby.

### 3.07 PROTECTION FOR WORK IN PLACE

- A. Work in Place: When subject to injury because of operations being carried on adjacent, cover, board up, or substantially enclose with adequate protection.
  - 1. Block and board heads, jambs and sills of permanent openings used as thoroughfares for introduction of work and materials.
  - 2. Construct forms of protection in manner that, upon completion, entire work will be delivered to Owner in undamaged condition.

### 3.08 ACCESS

- A. Limit access to necessary routes to perform the work.
  - 1. Coordinate access with Owner.
  - 2. See Section 01 10 00 for limitations on access to site.

### 3.09 TEMPORARY CONTROLS

- A. General: Comply with local codes, ordinances and regulations.
- B. Noise Control:
  - 1. Minimize noise at all times. All equipment shall be properly muffled. Do not operate noisy equipment after 10:00 p.m.
  - 2. Noise control, during demolition and construction, shall be of utmost importance. The Owner may order the Contractor to stop a portion of the work which they consider the cause of excessive noise.

3. The Owner may order a temporary delay or postponement of certain construction activity if, in their opinion, such activity is detrimental to any patient care procedures or other affected hospital operations.
  4. Jackhammers: Not allowed.
- C. Dust Control: When construction procedures result in dust which becomes a nuisance to the Owner, private property or traffic, control said dust.
1. Temporary Dust Partitions: Construct dust tight. Minimum construction to 3/8 inch gypsum board on metal studs spaced at 24 inches on center. Provide fiberglass sill seal at floor and tape all joints with duct tape. Provide 3 inch thick mineral fiber sound batt insulation on construction side of partitions.
  2. Tacky Mat: First Step as manufactured by Advanced Laminated Material Applications, Inc. Provide at all dust partitions and as indicated.
- D. Debris Control: Continually police the work to prevent collection and scattering of debris uncovered, loosened, or caused by prosecution of the work.
- E. Pollution Control: Take extreme caution to prevent spilling or littering of water polluting substances. Do not dump any foreign materials into any portion of the sewer and storm sewer collection systems. Provide such labor, equipment, and materials as is necessary to remedy such pollution. No burning of debris nor any other air polluting methods or equipment will be allowed.
- F. See Section 01 10 00 Summary for related requirements.

### 3.10 CLEANING OF THE WORK

- A. General: Maintain Project and site in clean and orderly condition. Periodically clean interior areas. Regularly remove waste materials, debris and rubbish from site.
- B. Interior Areas: Clean prior to start of finish work and continue cleaning as required. Control cleaning operations so that dust and other particles will not adhere to newly coated surfaces.

END OF SECTION

## SECTION 01 60 00

### PRODUCT REQUIREMENTS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative, and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. The Contractor's Constructions Schedule and the Schedule of submittals are included under Sections "Submittal Procedures."
- C. Standards: Refer to Section "References" for applicability of industry standards to products specified.

##### 1.02 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structures," "finishes," "Accessories," and similar. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
  - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "Material," "equipment," "system," and terms of similar intent.
  - 2. "Named Products" are items identified by manufacture's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
  - 3. "Foreign Products", as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens nor living within the United States and its possessions.
  - 4. "Materials", are products that substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to inform a part of the Work.
  - 5. "Equipment", is a product with operational part, whether motorized or manually operated, that requires service connections such as wiring or piping.

##### 1.03 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
  - 1. When specified products are available only form sources that do not or cannot produce a quantity adequate o complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Projects, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

- C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:
  - 1. No available domestic product complies with the Contract Document.
- D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
- E. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
- F. Equipment Nameplates: Provide a permanent nameplate on each item on service-connected or power-operated equipment. Locate on an easily accessible surface, which are inconspicuous occupied spaces. The nameplate shall contain the following information and other essential operating data:
  - 1. Name of product and manufacturer.
  - 2. Model and serial number.
  - 3. Capacity.
  - 4. Speed.
  - 5. Ratings.

#### 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacture's recommendations, using meanings and methods that will prevent damage, deterioration and loss, including theft.
- B. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
- C. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damage, or sensitive to deterioration, theft and other losses.
- D. Deliver Products to the site in the manufacture's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- E. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
- F. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
- G. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.
- H. Store products subjects to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

## **PART 2 PRODUCTS**

### **2.01 PRODUCT SELECTION**

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
  - 1. Provide products complete with an accessories, trim, finish, safety guards and other. Indicates and details needed for a complete installation and for the intended use and effect.
- B. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- C. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
  - 1. Where products or manufactures are specified by name, accompanied by the term “or equal,” or “ or approved equal “ comply with the Contract Document provisions concerning “substitutions” to obtain approval for use of an unnamed product.
  - 2. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
  - 3. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
  - 4. Manufacturer’s recommendations may be contained in published product literature, or by the manufacturer’s certification of performance.
  - 5. Compliance with Standards, Codes and Regulations: Where the Specification only requires compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
  - 6. Visual Matching: Where Specifications require matching and established Sample, the Architect’s decision will be final on whether a proposed product matches satisfactorily.
  - 7. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning “ substitutions “ for selection of a matching product in another product category, or for noncompliance with specified requirements.
  - 8. Visual Selection: Where specified product requirements include the phrase “ ... as selected from manufacturer’s standard colors, patterns, textures...” or a similar phrase, select a product and manufacturer that comply with other specified requirements. The Architect will select the color, patterned and texture from the product line selected.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION OF PRODUCTS**

- A. Comply with manufacturer’s instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
  - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until the time of Substantial Completion.

END OF SECTION



## SECTION 01 64 00

### OWNER-FURNISHED PRODUCTS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Owner-furnished products for installation by Contractor (O.F.C.I.).
- B. Related Requirements:
  - 1. Owner-Furnished, Owner-Installed (O.F.O.I.) Products: Section 01 10 00 Summary.
  - 2. Common Product Requirements, Transportation, Storage and Handling of Products: Section 01 60 00 Product Requirements.
  - 3. Examination and Acceptance of Substrates and In-Place Construction to Receive Product Installation: Section 01 71 16 Acceptance of Conditions.
  - 4. General Product Installation Requirements: Section 01 73 19 Installation.

##### 1.02 TRANSPORTATION AND HANDLING

- A. General: Comply with Section 01 60 00.
- B. Handling: Provide equipment and personnel to handle products by methods to prevent soiling or damage. Comply with manufacturer's written instructions.
- C. Material Safety Data Sheets (MSDS): During product transportation and handling, comply with controls specified on MSDS for each product required by OSHA to have a MSDS.
- D. Delivery: Coordinate delivery schedules with Owner.
- E. Inspection: Inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
  - 1. Immediately inform Owner of damaged and defective items, if any.

##### 1.03 STORAGE AND PROTECTION

- A. General: Comply with Section 01 60 00.

#### PART 2 PRODUCTS

##### 2.01 OWNER-FURNISHED PRODUCTS

- A. Products Furnished by Owner and Installed by Owner or Owner's Separate Vendor or Contractor: Items listed in Equipment Schedule on Drawings and identified as "O.F.O.I." See also Section 01 10 00.
- B. Products Supplied by Owner for Installation by Contractor Under This Contract: Items listed in Equipment Schedule or elsewhere on Drawings and identified as "O.F.C.I."

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Comply with Section 01 73 19 and applicable Sections in Divisions 03 through 31.

END OF SECTION



## SECTION 01 71 16

### ACCEPTANCE OF CONDITIONS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Procedures and general requirements for examination of existing conditions and verification of acceptable conditions for installation.
- B. Related Requirements:
  - 1. Common Product Requirements: Section 01 60 00 Product Requirements.
  - 2. General Product Installation Requirements: Section 01 73 19 Installation.
  - 3. Cutting and Patching: Section 01 73 29.

##### 1.02 QUALITY ASSURANCE

- A. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for verification of existing conditions to extent that these instructions and recommendations are more explicit or more stringent than requirements specified or indicated.
  - 1. Notify Architect of any conflicts between manufacturer's instructions or recommendations and requirements specified or indicated.
  - 2. Coordinate trades constructing substrate and trades installing products to substrate to ensure that surface preparation required by manufacturer's instructions is performed before product installation. Convene pre-installation conference if necessary and discuss issues relating to acceptance of conditions at conference.

#### PART 2 PRODUCTS – Not Used

#### PART 3 EXECUTION

##### 3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- C. Inspection of Substrates: Require installer of each major unit of work to inspect substrate to receive work and conditions under which work is to be performed.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- D. Installer: Report unsatisfactory conditions to General Contractor in writing with copy to Architect. Include recommended corrections.
- E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

END OF SECTION

## SECTION 01 73 19

### INSTALLATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Common requirements for installing products and materials.
- B. Related Requirements:
  - 1. Examination and Acceptance of Substrates and In-Place Construction to Receive Product Installation: Section 01 71 16 Acceptance of Conditions.
  - 2. Common Product Requirements, Transportation, Storage and Handling of Products: Section 01 60 00 Product Requirements.
  - 3. Cutting and Patching: Section 01 73 29.

##### 1.02 REFERENCES

- A. Reference Standards: Comply with the following as applicable:
  - 1. United States Department of Justice – 2010 ADA Standards for Accessible Design, September 15, 2010; available at [www.ada.gov/ADAStandards\\_index.htm](http://www.ada.gov/ADAStandards_index.htm).

##### 1.03 QUALITY ASSURANCE

- A. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to extent that these instructions and recommendations are more explicit or more stringent than requirements specified or indicated.
  - 1. Refer to manufacturer's warranty, where applicable, and comply with all installation stipulations necessary to obtain warranty.
  - 2. Compliance with manufacturer's instructions shall include compliance with manufacturer's requirements, if any, for verification of conditions and surface preparation prior to installation, and shall include manufacturer's instructions for protection and cleaning after installation.
  - 3. Notify Architect of any conflicts between manufacturer's instructions or recommendations and requirements specified or indicated.
  - 4. Maintain one copy of each on site from time of product delivery to site until installation and final cleaning of product is complete.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

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

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  
- B. Attachment: Provide attachment and connection devices and methods for securing work.
  - 1. Secure work true to line and level, and within specified tolerances, or if not specified, industry recognized tolerances.
  - 2. Allow for expansion and building movement.
  - 3. Exposed Joints:
    - a. Provide uniform joint width.
    - b. Arrange joints to obtain best visual effect.
    - c. Refer questionable visual-effect choices to Architect for final decision.
  
- C. Measurements and Dimensions: Recheck as integral step of starting each installation.
  
- D. Climatic Conditions and Project Status: Install each unit of work under conditions to ensure best possible results in coordination with entire Project.
  - 1. Isolate each unit of work from incompatible work as necessary to prevent deterioration.
  - 2. Coordinate enclosure of work with required inspections and tests to minimize necessity of uncovering work for those purposes.
  
- E. Mounting Heights: Where not indicated, mount individual units of work at industry recognized standard mounting heights for particular application indicated.
  - 1. Refer questionable mounting heights choices to Architect for final decision.
  - 2. Comply with ADA Standards as applicable.
  
- F. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  
- G. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

### **3.02 PROTECTION**

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

END OF SECTION

## SECTION 01 73 29

### CUTTING AND PATCHING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Work Results: All cutting, fitting and patching required to complete work and to:
  - 1. Make its 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.
  
- B. Related Requirements:
  - 1. Selective Demolition: Section 02 41 19.
  - 2. Trenching and Backfill: Section 31 23 33.

##### 1.02 ADMINISTRATIVE REQUIREMENTS

- A. Notification of Architect: Notify Architect well in advance of executing any cutting or alteration that affects:
  - 1. Work of Owner or any separate contractor.
  - 2. Structural value or integrity of any element of Project.
  - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
  - 4. Efficiency, operational life, maintenance or safety of operational elements.
  - 5. Visual qualities of sight-exposed elements.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

#### PART 3 EXECUTION

##### 3.01 EXAMINATION

- A. Existing Conditions:
  - 1. Examine existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
  - 2. After uncovering work, examine conditions affecting installation of products or performance of work.
  
- B. Notification: Report unsatisfactory or questionable conditions to Architect. Do not proceed with work until Architect has provided further instructions.

### 3.02 PREPARATION

- A. Protection: Provide adequate temporary support as necessary to ensure structural value and integrity of affected portion of work. Provide devices and methods to protect other portions of Project from damage.
  - 1. Provide protection from elements for that portion of Project that may be exposed by cutting and patching work.

### 3.03 CUTTING AND PATCHING

- A. General: Provide openings in construction that are required for later work.
  - 1. Various Contractors: Be responsible to supply in advance, proper and sufficiently detailed information for openings.
  - 2. In event of failure to supply this advance information, required cutting shall be done only after concurrence of Architect and at expense of negligent party.
- B. Cutting:
  - 1. Execute cutting and demolition by methods that will prevent damage to other work, and will provide proper surfaces to receive installation or repairs.
  - 2. Employ the original installer or fabricator to perform cutting and patching for:
    - a. Weather-exposed or moisture-resistant elements.
    - b. Sight-exposed finished surfaces.
  - 3. Employ the original installer or fabricator to perform cutting and patching for:
    - a. Weather-exposed or moisture-resistant elements.
    - b. Sight-exposed finished surfaces.
  - 4. Cut asphalt, concrete or masonry using masonry saw or core drill as applicable. Pneumatic tools will not be allowed unless accepted by Architect.
- C. Fitting: Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- D. Patching: Wherever any pipe, conduit, duct, steel member, bracket, equipment, or other material penetrates or passes through fire-resistant wall, ceiling or floor, completely seal voids in construction with cement grout, plaster, or fire-resistant material, embedding sealing material full thickness of wall, ceiling or floor.
- E. Finishing: Where surfaces are exposed, finish with same materials specified in finish schedule or material that is on constructed surfaces.
  - 1. Work: Accomplish with mechanics skilled in finish trade.
  - 2. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
    - a. For continuous surfaces, refinish to nearest intersection.
    - b. For assembly, refinish entire unit.

END OF SECTION

## SECTION 01 77 00

### CLOSEOUT PROCEDURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative, and procedural requirements for project closeout, including but not limited to.
  - 1. Inspection procedures.
  - 2. Project record document submittal.
  - 3. Operating and maintenance manual submittal.
  - 4. Submittal of warranties.
  - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 02 through 49.

##### 1.02 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following. List exception in the request.
  - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    - a. If 100 percent completion cannot be shown, include a list of delayed items, the value of delayed construction, and reasons the Work is not complete.
  - 2. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents, including the Contractor's written warranty of all work (in place) written on firm's letterhead stationary.
- B. Obtain and submit release enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases, including, but not limited to:
  - 1. Affidavit of Releases of Liens on AIA Form G706-A:
    - From Contractor
    - From Sub Contractor(s)
    - From Major material Supplier(s)
  - 2. Affidavit of Debts and Claims Payment on AIA Form G-706:
    - From Contractor
    - From Sub Contractor(s)
  - 3. Submit Contractor's Guarantee Showing:
    - a. One-year warranty from date of Final Acceptance listing all items, which were unable to be completed.
    - b. Certified and current copy of Power of Attorney.
  - 4. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, and similar final record information.

5. Deliver tools, spare parts, Extra stock, and similar items.
6. Advise the Owner's personnel of changeover in security provisions.
7. Complete start-up testing of systems, and instruction on the Owner's operating and maintenance personnel. Determined or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

### 1.03 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following: List exceptions in the request.
  1. Submit the final request with release and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
  2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
  3. Submit a certificated copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
  4. Submit consent of surety to final payment.
  5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspections Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.
- C. Upon completion of reinspections, the Architect will prepare a certificate of final acceptance, or advice the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
- D. If necessary, reinspections will be repeated.

### 1.04 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line whiteprints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
  1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
  2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or shop Drawings.
  3. Note related change Order numbers where applicable
  4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one of other written constructions issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of



the Specifications and modification. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon Completion of the Work, submit record Specifications to the Architect for the Owner's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work, which cannot otherwise be readily discerned later by direct observation. Note related Change orders and mark-up of record drawings and specifications.
1. Upon completion of mark-up, submit complete set of record Product Data to the Architect for the Owner's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filled, ready for continued use and reference. Submit to the Architect for the Owner's records.
- G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-inch vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information.
1. Emergency instructions.
  2. Spare parts list.
  3. Copies of warranties.
  4. Wiring diagrams.
  5. Recommended "turn around" cycles.
  6. Inspection procedures.
  7. Shop Drawings and Product Data.
  8. Fixture lamping schedule.

## **PART 2 PRODUCTS - Not Used**

## **PART 3 EXECUTION**

### **3.01 CLOSEOUT PROCEDURES**

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representative.

### 3.02 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition excepted in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- C. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
  - 1. Remove labels that are not permanent labels.
  - 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision obscuring materials. Replace chipped or broken glass and other damaged transparent material.
  - 3. Clean exposed exterior and interior hard-surfaced finishes to dust-free conditions, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition.
  - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures.
  - 5. Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- D. Removal of Protection: Remove temporary protection and facility installed for protection of the Work during construction.
- E. Compliance: Comply with regulations of authority having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
  - 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION

## SECTION 01 78 39

### WARRANTIES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative, and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard by the Contractor's Documents and special warranties.
- B. General closeout requirements are included in Section "Project Closeout."
- C. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions 02 through 49.
- D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

##### 1.02 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties require by or incorporate in the Contract Documents, either to extend time limit provide by standard warranties or to provide greater rights for the Owner.

##### 1.03 WARRANTIES REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that this failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is require on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

**PART 2 PRODUCTS** - Not Used

**PART 3 EXECUTION** - Not Used

END OF SECTION

## DIVISION 02 – EXISTING CONDITIONS

### SECTION 02 41 19

#### SELECTIVE DEMOLITION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Erect dustproof enclosures separating occupied from unoccupied areas before beginning demolition. Remove enclosures when work is completed and patch surfaces damaged by work.
  - 2. Remove designated partitions, walls, ceilings, floors, doors and frames, headwalls, cabinets, wood shutters, sinks and faucets, countertops, flooring, ductwork, piping and other building components.
  - 3. Cap and identify exposed utilities.
  - 4. Provide necessary shoring and bracing.
  - 5. Dispose of debris off site.
  - 6. Clean up and leave work area prepared for renovation.
- B. Related Requirements:
  - 1. Use of Premises: Section 01 10 00 Summary.
  - 2. Alteration Project Procedures: Section 01 35 16.
  - 3. Barricades, Warning Lights and Signs: Section 01 50 00 Temporary Facilities and Controls.
  - 4. Removal and Salvage of Construction Materials: Section 02 42 00.

##### 1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination with Occupants: Portions of the building will be occupied during construction. See Section 01 10 00 Summary and Section 01 35 16. Do not interfere with use of occupied portions of building. Maintain free and safe passage to and from occupied areas.
- B. Existing Utility Services:
  - 1. Capping: Arrange and pay for disconnecting, removing and capping utility services within areas of demolition. Disconnect and stub off. Notify affected utility company in advance and obtain approval before starting this work.
  - 2. Identification: Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

##### 1.03 SITE CONDITIONS

- A. Environmental Requirements: Execute demolition in manner to limit unnecessary dust and noise. Burning of materials on site not allowed.
- B. Existing Conditions:
  - 1. Asbestos-Containing Materials: This Project is not known to have asbestos-containing materials in area designated for demolition and renovation.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Materials to be Reused: Section 02 42 00..
- B. Materials to be Removed by Owner: Items which are removed prior to start of demolition shall remain property of Owner. All other items indicated to be removed but not indicated for salvage and/or reinstallation shall become property of Contractor who shall remove them from site.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Exterior Openings: Erect secure and weatherproof closures for exterior openings.
- B. Dust Protection: Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.
- C. Building Occupancy: Carry out demolition work to cause as little inconvenience to occupants as possible.
  - 1. Do not operate very noisy equipment such as jack hammers during normal business hours.

### **3.02 SELECTIVE DEMOLITION OF BUILDING ASSEMBLIES AND COMPONENTS**

- A. General: Demolish in orderly and careful manner as required to accommodate new work. Protect existing foundations and supporting structural members.
  - 1. Asbestos Containing Materials: If the Contractor suspects that existing asbestos containing materials have been uncovered during demolition, immediately stop work in the area and notify the Owner.
- B. Protection: Provide necessary temporary shoring and bracing to support and protect portions of existing building during demolition operations. Leave such shoring in place until permanent supports have been installed. Be solely responsible for design, safety and adequacy of temporary shoring and bracing and its ability to carry load for which intended.
- C. Safety: Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume until safety is restored.
- D. Repair: Repair demolition performed in excess of that required at no cost to Owner.

### **3.03 EXISTING FLOOR COVERINGS**

- A. Remove existing floor coverings where indicated or new floor coverings are scheduled. Remove existing mastic and leave floors smooth and clean and ready for new floor coverings.

### **3.04 CLEANING**

- A. During demolition operations, keep premises free from accumulations of waste material or rubbish caused by employees or work, and at completion of work remove rubbish, tools and

surplus material and leave premises clean and ready for subsequent work. Promptly remove waste, rubbish or debris from site.

END OF SECTION





## SECTION 02 42 00

### REMOVAL AND SALVAGE OF CONSTRUCTION MATERIALS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Remove designated building equipment, cabinets and fixtures. Store and protect items noted to be saved or reinstalled.
- B. Related Requirements:
  - 1. Use of Premises: Section 01 10 00 Summary.
  - 2. Alteration Project Procedures: Section 01 35 16.
  - 3. Selective Demolition: Section 02 41 19.

##### 1.02 PROJECT CONDITIONS

- A. Environmental Requirements: Execute removal in manner to limit unnecessary dust and noise.
- B. Existing Conditions: Portions of the building will be occupied during construction. See Section 01 10 00 Summary. Do not interfere with use of occupied portions of building. Maintain free and safe passage to and from occupied areas.

#### PART 2 PRODUCTS

##### 2.01 DISPOSITION OF REMOVED ITEMS

- A. Materials to be Removed by Owner: Items which are removed prior to start of demolition shall remain property of Owner. All other items indicated to be removed but not indicated for reinstallation or salvage to the Owner shall become property of Contractor who shall remove them from site.
- B. Products to be Salvaged and Delivered to Owner: All existing televisions, hardware, and medical equipment and fixtures indicated to be removed but not indicated to be relocated in the Work shall be salvaged for delivery to the Owner in good condition.
- C. Products and Materials to be Reused: All existing building components and equipment scheduled or noted to be reused in other portions of work shall be salvaged and stored on site for later reinstallation. Such products include, but are not necessarily limited to, the following:
  - 1. Nurse call.
  - 2. Diffuser.
  - 3. Ceiling tiles.
  - 4. Signage.
  - 5. Smoke detectors.
- D. Offer all other salvageable materials to Owner.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Building Occupancy: Carry out removal work to cause as little inconvenience to occupants as possible.

### **3.02 REMOVAL OF EQUIPMENT, BUILDING MATERIALS AND COMPONENTS, AND EXISTING EXTERIOR IMPROVEMENTS**

- A. General: Perform removal in orderly and careful manner as required to accommodate new work. Protect existing supporting structural members.
  - 1. Asbestos Containing Materials: If the Contractor suspects that existing asbestos containing materials have been uncovered during removal, immediately stop work in the area and notify the Owner.
- B. Materials to be Reused: Carefully remove materials, specialty items, equipment, casework, etc. scheduled or noted to be reused in other portions of work and store at site for later reinstallation.

### **3.03 REPAIR**

- A. Repair removal performed in excess of that required at no cost to Owner.
- B. Repair any damage caused during removal, storage or reinstallation to satisfaction of Architect.

### **3.04 CLEAN-UP**

- A. During removal operations, keep premises free from accumulations of waste material or rubbish caused by employees or work, and at completion of work remove rubbish, tools and surplus material and leave premises clean and ready for subsequent work. Promptly remove waste, rubbish or debris from site.

END OF SECTION

## DIVISION 05 - METALS

### SECTION 05 05 19

#### POST-INSTALLED CONCRETE ANCHORS

##### PART 1 GENERAL

###### 1.01 SUMMARY

- A. Section Includes:
  - 1. Methods common to multiple sections for fastening metals, fabrications, manufactured products, hangers, and equipment to in-place concrete, precast concrete, or concrete masonry, including:
    - a. Post-installed mechanical anchors.
    - b. Post-installed adhesive anchors.
- B. Related Requirements:
  - 1. Mechanical Expansion Anchors for Electrical Items and Supports: Division 26 Electrical.

###### 1.02 REFERENCES

- A. Definitions:
  - 1. Interior Use: For purposes of this Section, "Interior Use" shall mean interior applications in a non-corrosive environment.
  - 2. Exterior Use: For purposes of this Section, "Exterior Use" shall mean applications exposed to weather in service and interior applications in a potentially corrosive environment, including, but not limited to, the interior of parking structures, pool rooms, pool equipment rooms, vehicle service and wash areas, animal holding rooms, shower areas and steam rooms.
- B. Reference Standards: See Section 01 42 00.
  - 1. American Concrete Institute (ACI) Standards:
    - a. ACI 355.2-07 - Qualification of Post-Installed Mechanical Anchors in Concrete.
    - b. ACI 355.4-11 - Qualification of Post-Installed Adhesive Anchors in Concrete.
  - 2. International Code Council Evaluation Service (ICC-ES) Standards:
    - a. AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements.
    - b. AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

###### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's technical data for the following.
  - 1. Post-Installed Anchors: Submit for each type proposed for use on Project. Include statement of proposed applications and locations for each type of anchor.

###### 1.04 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Evaluation Reports: Submit ICC-ES Evaluation Report for each manufactured anchor product proposed for use on the Project.

- C. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- D. Manufacturer's Instructions:
  - 1. Submit manufacturer's installation instructions.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 65 00 and Section 01 66 00.
  - 1. Protect metals from corrosion.
- B. Storage and Handling Requirements:
  - 1. Storage: Store manufactured anchors in accordance with manufacturer's recommendations.

### **PART 2 PRODUCTS**

#### 2.01 PRODUCT OPTIONS

- A. Basis of Design Anchor Manufacturer and Model: Where anchor manufacturer and model is indicated on Drawings, provide indicated product.
- B. Where anchor manufacturer and model is not indicated on Drawings, subject to compliance with other specified requirements, provide one of the products named in this Section for anchor type indicated.
  - 1. Include anchors required to comply with installation instructions and typical details of product manufacturers and equipment suppliers under all divisions of these Specifications, where anchors are not furnished by supplier of the product or equipment to be anchored.
- C. Substitution Requests: Required for all proposed post-installed anchor manufacturers and products not named in this Section or on Drawings.
  - 1. Submit current ICC-ES report with each proposed anchor substitution request. Report shall include compliance documentation for the proposed:
    - a. Base material to receive anchor;
    - b. Base material condition limitations;
    - c. Applicable loading conditions; and
    - d. Load direction(s).
  - 2. Submittals: Submit in accordance with Section 01 25 00.

#### 2.02 REGULATORY REQUIREMENTS

- A. Manufactured post-installed anchors shall have published ICC-ES Evaluation Report (ICC-ESR) indicating conformance with current applicable ICC-ES Acceptance Criteria and ICC approval as acceptable method of construction under the IBC. Comply with all limitations on use of anchors stipulated in Evaluation Report.
- B. Post-Installed Anchors for Supporting Fire Sprinkler Systems: Comply with NFPA 13. Anchors shall be qualified in accordance with UL for use with "Pipe Hanger Equipment and Fire Protection Systems."

#### 2.03 POST-INSTALLED ANCHOR MATERIALS, GENERAL

- A. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) or hot-dip galvanizing in accordance with ASTM A153.

## 2.04 MECHANICAL ANCHORS

- A. Regulatory Requirements:
1. Mechanical Anchorage to Concrete: Expansion anchors, wedge anchors, sleeve anchors, undercut anchors, and drop-in anchors shall have current ICC-ES report that demonstrates compliance with ACI 355.2 as supplemented by AC193 for use in cracked concrete.
    - a. Structural Anchorages and Safety Related Anchorages in Structures Designed for Seismic Design Category C, D, E, or F: Documentation shall also show that anchor has passed simulated seismic tests in accordance with ACI 355.2.
      - 1) Seismic Design Category: See General Notes on Structural Drawings.
- B. Wedge Anchors for Anchorage to Solid Concrete:
1. Manufacturers and Products: Where anchor manufacturer and product is not indicated, subject to compliance with requirements, provide the following:
    - a. Hilti Inc.; [www.us.hilti.com](http://www.us.hilti.com) - Kwik Bolt TZ (KB-TZ). Refer to ICC ESR-1917.
  2. Description: Wedge type expansion anchor, torque-controlled, complete with required nuts and washers.
  3. Provide anchors with length identification markings conforming to ICC ES AC193.
  4. Type and size as indicated on Drawings or by manufacturer of product to be anchored.

## 2.05 CARTRIDGE INJECTION ADHESIVE ANCHORS

- A. Regulatory Requirements.
1. Adhesive Anchorage to Concrete: Adhesive anchors shall have current ICC-ES report that demonstrates compliance with ACI 355.4 as supplemented by AC308 for use in cracked concrete.
    - a. Structural Anchorages and Safety Related Anchorages in Structures Designed for Seismic Design Category C, D, E, or F: Documentation shall also show that anchor has passed simulated seismic tests in accordance with ACI 355.4.
      - 1) Seismic Design Category: See General Notes on Structural Drawings.
- B. Manufacturers and Products – Anchorage to Concrete: Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
1. Hilti Inc.; [www.us.hilti.com](http://www.us.hilti.com) – HIT RE 500-SD Adhesive Anchoring System with two-component epoxy with threaded rod anchors. Refer to ICC ESR-2322.
  2. ITW Red Head division of Illinois Tool Works; [www.itwredhead.com](http://www.itwredhead.com) – Epcon G5 Adhesive Anchoring System with two-component epoxy and threaded rod anchors. Refer to ICC ESR-1137.
  3. Powers Fasteners; [www.powers.com](http://www.powers.com) - PE1000+ Epoxy Adhesive Anchoring System with two-component epoxy and threaded rod anchors. Refer to ICC ESR-2583.
  4. Simpson Strong Tie Co.; [www.strongtie.com](http://www.strongtie.com) – Set-XP Epoxy Adhesive Anchors with two-component epoxy and threaded rod anchors. Refer to ICC ESR-2508.
- C. Steel Anchors: Threaded steel rod or inserts, complete with nuts, washers, adhesive injection system. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) or carbon steel rods conforming to ASTM A510 with chemical composition of AISI 1038.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. General: Install post-installed anchors and inserts in accordance with applicable ICC-ES Report and with manufacturer's instructions in accurately drilled holes of required diameter and depth.
  - 1. Avoid installing anchors in contact with galvanically dissimilar metals.
  
- B. Drilling:
  - 1. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, and grout has achieved full design strength.
  - 2. Drill holes with rotary impact hammer drills using carbide-tipped bits and core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
    - a. Cored Holes: Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer.
    - b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Architect and Structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
  
- C. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of the specified torque, 100 percent of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Architect and Structural Engineer.
  
- D. Cartridge Injection Adhesive Anchors: Clean all holes in accordance with manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Holes may be dry, damp or wet. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
  
- E. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

### **3.02 ADJUSTING**

- A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

### **3.03 SITE QUALITY CONTROL**

- A. Testing, General: See Section 01 45 20.

- B. Testing of Post-Installed Anchors: . Quality control testing shall be performed by independent testing agency in consultation with manufacturer's representative.
  - 1. Testing: Comply with Expansion Anchor Bolt Notes on Structural Drawings.
  
- C. Special Inspection: See Section 01 45 20.
  - 1. Special inspection is required for all post-installed anchor installations.

END OF SECTION





## SECTION 05 12 53

### MISCELLANEOUS STRUCTURAL STEEL

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Structural steel anchorages and support assemblies connecting to existing structure.
- B. Related Requirements:
  - 1. General Notes on Structural Drawings.
  - 2. Post-Installed Concrete Anchors: Section 05 05 19.
  - 3. Bracing: Section 05 40 00 Cold-Formed Metal Framing.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with listed reference standards except as superseded by notes on the Drawings or by these Specifications.
  - 1. Design, Detailing, Fabrication and Erection: ANSI/AISC 360-10 - Specification for Structural Steel Buildings, June 22, 2010.
  - 2. AISC 303-10 - Code of Standard Practice for Steel Buildings and Bridges, limited to the following:
    - a. Fabrication, Delivery and Erection of Steel: Comply with Sections 5 through 8.
  - 3. American Welding Society (AWS) Standards:
    - a. AWS D1.1/D1.1M - Structural Welding Code – Steel, 2010 Edition.
  - 4. Society for Protective Coatings SSPC-PA 1 - Shop, Field and Maintenance Painting of Steel.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.
- B. Shop Drawings: Submit shop and erection drawings for all members and assemblies under this Section.
  - 1. Shop drawings shall be original drawings produced by the subcontractor or supplier and shall not be reproductions of the Contract Documents.
  - 2. Shop drawings shall clearly indicate the following:
    - a. Profiles, sizes, spacing, and locations of structural steel members.
    - b. Connections, attachments, and anchorages.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Certificates:
  - 1. Mill Test Reports:
    - a. Upon request, furnish for all structural steel supplied.
    - b. Furnish mill test reports and load test results of each lot of high strength bolts if requested by Architect.
  - 2. Welder Certificates: Furnish for all welding operators used for fabrication and erection.

## 1.05 QUALITY ASSURANCE

### A. Qualifications:

1. Welder Qualifications: Welding shall be performed only by certified welding operators currently qualified in accordance with the testing procedures of AWS D1.1 for the weld types and positions required for the installations indicated..
  - a. If recertification of welders is required, retesting shall be Contractor's responsibility.

## 1.06 DELIVERY, STORAGE, AND HANDLING

### A. General Requirements: Comply with Section 01 66 00.

### B. Storage and Handling Requirements:

1. Steel: Store members above ground on platforms, skids or other supports and stored upright to prevent twisting. Protect steel from corrosion.

## **PART 2 PRODUCTS**

### 2.01 STRUCTURAL STEEL SHAPES

#### A. Channels (C and MC) and Angles (L): ASTM A36.

#### B. Bars and Plates: ASTM A36.

### 2.02 FASTENERS, ANCHORS AND WELDING MATERIALS

#### A. See Section 05 05 19 for related requirements.

#### B. Bolts: ASTM A307.

1. Type: Type N with bolt threads included in shear plane.

#### C. Nuts: ASTM A563.

#### D. Washers: Provide flat circular washers or square or rectangular beveled washers as indicated or required for each bolted connection.

#### E. Welding Materials for Steel:

1. Filler Metals for Welding: Meet requirements of AWS D1.1.
  - a. Strength Level: In accordance with AISC and AWS specifications for base metals joined, weld type, and direction of applied load to weld.
2. Welding Electrodes: AWS 5.1 or A 5.5.

### 2.03 FABRICATION

#### A. General: Fabricate structural steel in accordance with AISC specifications.

#### B. Connections: Fabricate structural steel components with shop-welded connections or shop-bolted connections as indicated and to provide for field-welded or field-bolted connections as shown or noted on the Drawings.

#### C. Finished Work: Finish work in accordance with accepted shop drawings.

1. Work: True and free from twists, kinks, buckles, open joints and other defects.

- D. Welding: Comply with AISC Specifications and AWS D1.1.
  - 1. Weld sizes not indicated on Drawings shall be ¼-inch continuous fillet but not less than AISC specified minimum based on thickness of parts joined.

## 2.04 SHOP FINISHES

- A. General:
  - 1. Structural Steel Surfaces: Clean and shop coat all fabricated items with shop primer in accordance with SSPC-PA 1.
- B. Shop Primer: Comply with OSHA Subpart R. One of the following.
  - 1. Tnemec Series 10 modified alkyd primer.
  - 2. Society for Protective Coatings Specification SSPC-Paint 25 lead and chromate free primer.
- C. Shop Priming:
  - 1. Surface Preparation: After fabrication and shop assembly, clean off all loose rust, loose mill scale and weld spatter, slag or flux deposits in accordance with SSPC procedures as follows:
    - a. Surfaces to be Concealed in the Completed Structure: SSPC-SP 3 Power Tool Cleaning or better.
    - b. Surfaces to be Exposed in the Completed Structure: SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
  - 2. Shop Paint Thickness:
    - a. Standard Shop Primer: 2.5 dry film mils.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Protection: Protect adjacent materials or areas below from damage due to weld splatter or sparks during field welding.
- B. Field Measurements: Take measurements on site as required for correct fabrication and installation. Be responsible for errors in fabrication and for correct fit of structural steel.

### 3.02 INSTALLATION

- A. General: Follow applicable provisions of AISC specifications.
- B. Install structural steel to lines and elevations indicated within specified erection tolerances.
  - 1. Align and adjust accurately before fastening.
  - 2. Splice only where indicated on Drawings.
  - 3. Field correction of fabricated items by gas cutting not allowed.
- C. Field Connections: Make connections between steel members with bolts or field welding as indicated.
  - 1. Clean existing surfaces before welding to existing steel.
  - 2. Tighten bolts to snug tight condition with nut rotation sufficient to bring all plies in joint into firm contact.
  - 3. Drifting or cutting to enlarge unfair holes not allowed.
  - 4. Make minor corrections by reaming.

- D. Field Modification: Using cutting torch for field modification or refabrication of structural steel not allowed without written acceptance of Architect. Be responsible for errors in fabrication and for correct fit in field.
- E. Allowable Tolerances: Comply with requirements of AISC Code of Standard Practice.
  - 1. Deviation of member working point horizontal location and elevation with respect to the supporting member shall not exceed plus-or-minus 1/16-inch from the location and elevation shown on Drawings.

### 3.03 SITE QUALITY CONTROL

- A. Testing, General: See Section 01 45 00.
- B. Field Inspection by Testing Agency: Include examination of erected steel for welding, proper fitting and tensioning of bolts and alignment.
- C. Weld Testing: If directed by the Architect, weld tests of shop welds and/or field welds will be made by an approved testing agency experienced in X-ray or ultrasonic testing of weld joints, selected and paid by the Owner.
  - 1. Testing Agency will have authority to reject weldments. Such rejection may be based on visual inspection where in his opinion weldment would not pass more detailed investigation.
  - 2. All rejected welds shall be replaced and retested at the expense of the subcontractor.

END OF SECTION

## SECTION 05 40 00

### COLD-FORMED METAL FRAMING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Structural metal stud framing, vertical and horizontal.
  - 2. Metal stud braces.
  - 3. Other structural metal stud framing as indicated.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. ANSI/AISI Standards:
    - a. AISI S100-2007 - North American Specification for the Design of Cold-Formed Steel Structural Members, as amended by the following Supplement.
      - 1) AISI S100-07/S2-10 – Supplement No. 2 to the North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition.
    - b. AISI S200-2007 – North American Standard for Cold-Formed Steel Framing – General Provisions.
    - c. AISI S201-2007 – North American Standard for Cold-Formed Steel Framing – Product Data.
  - 2. Welding: ANSI/AWS D1.3 Structural Welding Code - Sheet Steel.
  - 3. ASTM C955 - Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.
  - 4. Steel Stud Manufacturers Association (SSMA) – Product Technical Information.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, action and return in accordance with Section 01 33 00.
- B. Product Data: Submit two copies of manufacturer's current catalog literature and installation instructions for each product specified under this Section with all materials and accessories plainly identified.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Allied Studco; [www.studco.com](http://www.studco.com).
  - 2. California Expanded Metal Products Company (CEMCO); [www.cemcosteel.com](http://www.cemcosteel.com).
  - 3. ClarkDietrich Building Systems LLC, [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 4. MarinoWARE; [www.marinoware.com](http://www.marinoware.com).
  - 5. Angeles Metal Systems.
- B. Substitution Requests: In accordance with Section 01 25 00.

## 2.02 MATERIALS

- A. Steel Mechanical Properties: Conform to requirements of AISI Specification, Section A3.
  - 1. Minimum Yield Point for Material 16 Gage to 10 Gage in Thickness: 50,000 psi.
  - 2. Minimum Yield Point for Material 18 Gage and Less in Thickness: 33,000 psi.
- B. Steel Sectional Properties and Design: Computed in accordance with AISI Specification.
- C. Steel Studs, Tracks, Bracing, Bridging and Related Metal: ASTM C955.
  - 1. Provide type and size of structural studs, exterior wall studs, track, bridging, and fasteners as indicated on Drawings and specified in this section.
  - 2. Studs: Sizes and locations as indicated on Drawings.
- D. Finish: Corrosion resistant galvanized coating conforming to ASTM A653, G60 minimum.

## 2.03 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: ASTM A90, hot-dip galvanized.

## **PART 3 EXECUTION**

### 3.01 INSTALLATION

- A. Connections: Screwed as indicated on the Structural Drawings.

END OF SECTION

**SECTION 05 50 00**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. All miscellaneous angles, channels, tubes and plates as indicated and required.
- B. Related Requirements:
  - 1. Post-Installed Concrete Anchors: Section 05 05 19.

1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. Design, Detailing, and Fabrication: ANSI/AISC 360-10 - Specification for Structural Steel Buildings.
  - 2. AISC 303-10 - Code of Standard Practice for Steel Buildings and Bridges, limited to the following:
    - a. Fabrication, Delivery and Erection of Steel: Comply with Sections 5 through 8.
    - b. Fabrication, Erection, and Dimensional Tolerances for Exposed Steel Fabrications: Comply with Section 10.
  - 3. Welding: AWS D1.1/D1.1M – 2010 Structural Welding Code – Steel.
  - 4. Painting: Society for Protective Coatings SSPC-PA 1 - Shop, Field and Maintenance Painting of Steel.

1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Shop Drawings: Submit for all custom fabricated items under this Section.
  - 1. Shop drawings shall clearly indicate the following:
    - a. Profiles, sizes, spacing, and locations of members.
    - b. Connections, attachments, and anchorages.
    - c. Size and type of fasteners.
    - d. Finishes, coatings and shop painting.
  - 2. Include erection drawings, elevations and details where applicable.
  - 3. Indicate weld lengths and sizes.

1.04 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Welder Qualifications: Welding shall be performed only by certified welding operators currently qualified in accordance with the testing procedures of AWS D1.1 for the weld types and positions required for the fabrications and installations indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 65 00 and Section 01 66 00.

- B. Storage and Handling Requirements:
  - 1. Store metals above ground on platforms, skids, or other supports. Protect metals from corrosion.
  - 2. Store other materials in weathertight and dry place, until ready for use.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Carbon Steel Shapes, Bars and Plates: ASTM A36.
- B. Steel Pipe and Tubing: ASTM A53, Grade B, or A500, Grade B, minimum wall thickness 11 gage.
- C. Threaded Rod: ASTM A36.
- D. Steel Fasteners and Anchors:
  - 1. Bolts: ASTM A325.
  - 2. Nuts: ASTM A563.
  - 3. Washers: ASTM F436.
- E. Welding Materials for Carbon Steel:
  - 1. Filler Metals for Welding: Meet requirements of AWS D1.1.
  - 2. Welding Electrodes: AWS 5.1 or A 5.5.

### **2.02 FABRICATION**

- A. Exposed Steel Fabrications: Interior and exterior steel fabrications and connections which will remain exposed and subject to normal view by the public or occupants of the completed structure shall be subject to all requirements for Architecturally Exposed Structural Steel specified in Section 10 of the AISC Code of Standard Practice.
- B. Shop Assembly: Fabricate custom metal fabrications as indicated, scheduled or listed in Article 1.01.
  - 1. Fabricate in accordance with details and accepted shop drawings.
  - 2. Provide miscellaneous items of metal work indicated or as necessary to complete work.
  - 3. Materials: New stock of types and sizes indicated.
  - 4. Make cuts clean and sharp with wire edges ground smooth. Provide straight, rigid, and tight work, free from defects.
  - 5. Close exposed ends of steel pipe or tubing with welded caps.
  - 6. Verify dimensions on site prior to shop fabrication.
  - 7. Fabricate items with joints neatly fitted and properly secured.
  - 8. Fit and shop assemble, in largest practical sections, for delivery to site.
  - 9. Exposed mechanical fastenings shall be flush, countersunk screws or bolts, unobtrusively located, consistent with design of structure, except where specifically noted otherwise.
  - 10. Make exposed joints flush butt-type, hairline joints where mechanically fastened.
  - 11. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified or detailed.
  - 12. Welding: AWS D1.1. Miter and cope intersections and weld all around. Remove splatter, grind exposed welds to blend and contour surfaces to match those adjacent.
  - 13. Substitutions: Where exact sizes and weights called for are not available, secure Architect's acceptance of suitable sizes prior to proceeding.



## 2.03 SHOP FINISHES

- A. Shop Paint:
  - 1. Steel Items to Receive Painted Finish or To Be Concealed in Completed Structure: One of the following.
    - a. Tnemec Series 10 modified alkyd primer.
    - b. Society for Protective Coatings Specification SSPC Paint 25 lead and chromate free primer.
- B. Shop Priming:
  - 1. Surface Preparation: After fabrication and shop assembly, clean off all loose rust, loose mill scale and weld spatter, slag or flux deposits in accordance with SSPC procedures as follows:
    - a. Surfaces to be Concealed in the Completed Structure: SP-3 power tool cleaning.
    - b. Surfaces to be Exposed in the Completed Structure: SP-6 commercial blast cleaning.
  - 2. Paint Application: Shop coat fabricated items with shop paint in accordance with SSPC-PA-1.
    - a. Omit shop paint on surfaces to be enclosed in concrete and surfaces to be field welded.
    - b. Standard Shop Paint Thickness: 2.5 dry film mils.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Weld or bolt items securely in place or otherwise fasten as indicated on the Drawings or accepted shop drawings. Include items indicated, scheduled or listed in Article 1.01.
- B. Install items square and level, accurately fitted and free from distortion or defects.
- C. Field Welds: Perform field welding in accordance with AWS D1.1.
  - 1. Painted Fabrications: Grind smooth and touch up with compatible primer.

### 3.02 ADJUSTMENTS

- A. Repair of Defective Work: Remove stained or otherwise defective work. Replace with new material.

END OF SECTION



## DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

### SECTION 06 10 53

#### MISCELLANEOUS ROUGH CARPENTRY

##### PART 1 GENERAL

###### 1.01 SUMMARY

- A. Section Includes:
  - 1. Roofing and flashing blocking.
  - 2. Partition blocking.
  - 3. Miscellaneous blocking and supports.
  - 4. Miscellaneous wood sheathing.
  - 5. Preservative treatment.
  - 6. Fire-retardant treatment.
- B. Related Requirements:
  - 1. Architectural Wood Casework: Section 06 41 00.

###### 1.02 REFERENCES

- A. Reference Standards. See Section 01 42 00. Comply with the following:
  - 1. Wood Framing: Comply with requirements of the 2013 California Building Code and ANSI/AF&PA NDS-2012 National Design Specification for Wood Construction, as published by the American Wood Council of the American Forest and Paper Association.
  - 2. Lumber: Grading Rules for Lumber, latest edition, as published by Western Wood Products Association.
  - 3. Plywood: National Institute of Standards and Technology (NIST) – Voluntary Product Standard PS 1-09 - Structural Plywood.
  - 4. Performance Rated Wood Sheathing Panels:
    - a. APA PRP-108 - Performance Standards and Policies for Structural-Use Panels.
    - b. National Institute of Standards and Technology (NIST) – Voluntary Product Standard PS 2-10 – Performance Standard for Wood-Based Structural-Use Panels.
  - 5. Treatment:
    - a. AWPA C2 – Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Processes.
    - b. AWPA C20 – Structural Lumber – Fire-Retardant Treatment by Pressure Process.
    - c. AWPA C27- Plywood – Fire-Retardant Treatment by Pressure Process.
    - d. AWPA P5 – Standard for Waterborne Preservatives.
    - e. AWPA Standard P17 - Fire Retardant Formulations.
    - f. AWPA Use Category System, Appendix H.

###### 1.03 QUALITY ASSURANCE

- A. Grade Stamps:
  - 1. Lumber: Each piece shall be WWPA or WCLIB grade stamped.
  - 2. Wood Sheathing: Each panel shall be identified with the grade trademark of the APA.
  - 3. Lumber Specified to be Preservative Treated: Each piece shall be stamped to indicate compliance with AWPA pressure treatment standards.
- B. Treatment Labels: Label each piece of treated lumber.
  - 1. Fire Treated Lumber: UL labels.

## 1.04 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Storage: Stack all materials minimum of 6 inches above ground to ensure proper ventilation and cover with waterproofing covering.

## PART 2 PRODUCTS

### 2.01 WOOD MATERIALS

- A. General Requirements:
  - 1. Lumber: Sound, thoroughly seasoned, surfaced four sides, well manufactured and free from warp not correctable by bridging, blocking or nailing.
  - 2. Moisture Content: Provide dry lumber as defined by the American Softwood Lumber Standard PS 20, with moisture content limited to maximum 19 percent moisture content, graded S-DRY, KD or KD-HT, as documented by grade stamp.
  - 3. Dimension Lumber Noted on Drawings to be Non-Combustible: Fire retardant treated with chloride salts.
- B. Blocking, Furring and Miscellaneous Dimension Lumber: Douglas Fir-Larch or Hem-Fir. Standard Grade or Better.
  - 1. Blocking in Contact with Roofing Membrane: Pressure treated with preservative.
  - 2. Interior Blocking: Fire retardant treated.
- C. Miscellaneous Panels for Interior Application: APA plywood BDX interior with exterior glue.  $\frac{3}{4}$ -inch thickness unless otherwise indicated.
  - 1. Electrical Component Mounting: Fire retardant treated.

### 2.02 TREATMENT

- A. Preservative Treatment of Dimension Lumber: All blocking in contact with roof membrane, exterior plates, posts embedded in concrete, and blocking and plates in contact with concrete or masonry shall be pressure preservative treated.
  - 1. Acceptable Products: Osmose NatureWood Preservative or accepted substitute.
  - 2. Type: Waterborne, alkaline copper quaternary preservative system with co-biocide, registered by EPA as a non-restricted use pesticide.
  - 3. Minimum Preservative Retention:
    - a. Plates and Blocking: 0.40 lbs of preservative per cubic foot of wood.
  - 4. Water Repellent Additive: Required.
  - 5. Treated Wood: Kiln-dried after treatment.
- B. Fire Retardant Treated Plywood: All sheathing required to be fire retardant-treated shall be pressure-treated in accordance with AWPA Standard C27 with an approved low hygroscopic, high temperature Interior Type A-HT fire retardant.
  - 1. Each panel shall be labeled or marked by an approved independent testing agency.
  - 2. After treatment, plywood shall be dried to an average moisture content of 15 percent or less.

### 2.03 FASTENERS, ANCHORS AND HARDWARE

- A. General: Provide necessary bolts, screws, nails, clips, plates, straps, hangers, etc. necessary for completion of rough carpentry. Provide correct material of proper size and strength for purpose intended conforming to specifications, drawings and applicable building codes. Supply anchors to be cast into concrete and masonry for anchorage of wood for installation under other Sections.

- B. Exterior Applications: Provide fasteners hot dip galvanized in accordance with ASTM A153.
- C. Fasteners for Use in Pressure Treated Wood: One of the following:
  - 1. Stainless steel.
  - 2. Steel, hot-dip galvanized to G185 in accordance with ASTM A653.
  - 3. Steel, Batch/Post Hot-Dip Galvanized in accordance with ASTM A153.
  - 4. Steel, mechanically galvanized to Class 55 or greater in accordance with ASTM B695.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Verify that surfaces to receive rough carpentry are prepared to required grades and dimensions.

### **3.02 INSTALLATION**

- A. General:
  - 1. Perform in substantial manner consistent with accepted standards of carpentry trade.
  - 2. Framing: Erect plumb, level and true and rigidly anchor in place. Cut framing square on bearings, closely fit, accurately set to required lines and levels.
  - 3. Nail or spike members in accordance with IBC and General Structural Notes on Drawings.
  - 4. Framing: 16 inches on center unless otherwise indicated.
  - 5. Shims: Do not use shims for leveling on wood or metal bearings. Use steel shims with full bearing on masonry or concrete.
  - 6. Metal Framing Anchors: Install where required for proper connections in accordance with manufacturer's recommendations.
- B. Anchors: Unless otherwise indicated, bolt plates firmly to concrete or masonry with 3/8-inch by 12 inches (3-inch horizontal leg) anchor bolts, 2'-0" on center or use powder-actuated fastening system.
  - 1. Size and Spacing: Accepted by Architect.

### **3.03 WOOD BLOCKING AND MISCELLANEOUS LUMBER REQUIRED FOR WORK OF OTHER SECTIONS**

- A. General: Cooperate with other trades. Provide required grounds, blocking, wood backing and framing. Perform necessary cutting and patching of rough carpentry work as required.
- B. Interior Blocking: Install blocking of size required for support of handrails, toilet and bath accessories, wall-mounted door stops, wall cabinets and other wall-mounted accessory items. Set true to line, level or plumb well secured in stud wall and flush with back of drywall or other wall finish.
- C. Exterior Blocking:
  - 1. Install blocking of size required for roof edge details and other locations as indicated.
  - 2. Roof Blocking: Anchor at 3 feet on center to resist force of 75 lbs. per lineal foot.

END OF SECTION



## SECTION 06 41 00

### ARCHITECTURAL WOOD CASEWORK

#### PART 1 GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. New custom plastic-laminate-clad casework.
2. Relaminating existing casework with new plastic laminate.
3. Cabinet hardware and accessories.

###### B. Related Requirements:

1. Wood Blocking: Section 06 10 53 Miscellaneous Rough Carpentry.
2. Solid Surfacing Countertops: Section 12 36 61 Simulated Stone Countertops:
3. Wood Doors: Section 08 14 00 Wood Doors.
4. Door Hardware: Section 08 71 00.
5. Plumbing Fixtures: Division 22.
6. Electrical Devices and Lighting Fixtures: Division 26 Electrical.

##### 1.02 REFERENCES

###### A. Definitions: The following definitions apply to plastic-laminate-clad casework:

1. Exposed portions of casework include all surfaces visible when doors and drawers are closed and all visible members in open shelf cases.
2. Semi-exposed portions of casework includes those members behind doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms and the back face of doors. Tops of cases 6'-6" or more above floor shall be considered as semi-exposed. All visible members behind glass doors also shall be considered as semi-exposed portions.
3. Concealed portions of case work include sleepers, web frames, dust panels and other surfaces not usually visible after installation.

###### B. Reference Standards: See Section 01 42 00. Comply with following:

1. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), First Edition, October 1, 2009.
  - a. Unless otherwise indicated, comply with AWS for grades of interior architectural woodwork, construction, finishes and other requirements.
    - 1) Comply with Custom Grade if not otherwise specified.
2. American National Standards Institute (ANSI);
  - a. ANSI A135.4-2004 – Basic Hardboard.
  - b. ANSI/BHMA A156.9-2003 - American National Standard for Cabinet Hardware.
  - c. ANSI/NPA A208.1-2009 – Particleboard.
  - d. ANSI A208.2-2009 - Medium Density Fiberboard (MDF) for Interior Applications.
3. Builders Hardware Manufacturers Association (BHMA):
  - a. BHMA A156.9-2003 – Cabinet Hardware.
4. South Coast Air Quality Management District (SCAQMD) Rule No. 1168.

##### 1.03 ACTION SUBMITTALS

###### A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

###### B. Product Data: Submit catalog data for all countertop surfacing materials, countertop setting and grouting materials, shelving and shelving hardware.

- C. Shop Drawings: Include conformance to required reference standard.
  - 1. Cabinets and Casework: Submit shop drawings for plastic faced casework and countertops showing layout, elevations, ends, cross sections, service run spaces, and location of services. Show details and location of anchorages and fitting to floors, walls and base. Indicate all hardware and accessory items.
    - a. Indicate materials, assembly methods, joint details, fastening methods, accessory listings, location of hardware, and schedule of finishes for each casework item.
    - b. Include layout of units with relation of surrounding walls, doors, windows and other building components.
    - c. Coordinate shop drawings with other work involved.
- D. Samples:
  - 1. Material Samples:
    - a. Submit two 2-inch by 3-inch samples of specified plastic laminate colors, patterns and textures for exposed and semi-exposed materials for Architect's selection or verification. Samples will be reviewed by Architect for color, texture and pattern only. Compliance with other specified requirements is the exclusive responsibility of the Contractor.
    - b. Submit samples of PVC edges for color selection or verification.
    - c. Submit sample of each type and finish of cabinet and shelf hardware for approval before ordering hardware. 6x6 mock-ups of sample construction.
    - d. Submit samples of resin panels for Architect's color, pattern, and texture verification.

#### 1.04 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Certificates:
  - 1. Particleboard and MDF: Submit third-party certification that formaldehyde emissions comply with Phase 1 standards of CARB Air Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products, and with ANSI A208.1 or A208.2 as applicable, when tested in accordance with ASTM E1333.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery and Acceptance Requirements:
  - 1. Humidity: Do not deliver material until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content. Maintain wood material storage area relative humidity at between 25 percent and 55 percent.
- C. Storage and Handling Requirements: Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

### **PART 2 PRODUCTS**

#### 2.01 SOLID STOCK WOOD MATERIALS

- A. General Requirements for Interior Wood Materials:
  - 1. Solid Stock Lumber Grade: In accordance with AWS rules for Custom Grade construction with specified finish unless indicated otherwise.
  - 2. Moisture Content: Minimum 5 percent, maximum 10 percent at delivery.



## 2.02 WOOD-BASED COMPOSITE PANELS

- A. Plywood:
  - 1. Veneer Faced Plywood: AWI Grade AA.
    - a. Painted Finish: AWI Grade B poplar veneer over plywood core.
  - 2. Plywood to Receive Plastic-Laminate: Commercial Standard Good Grade, minimum 3/4-inch thick before lamination.
  - 3. Maximum Allowable Formaldehyde Emissions: 0.05 ppm.
  
- B. Particleboard: ANSI A2.08.1, Grade M-2 or better. Matte formed wood particleboard, 40-45# density industrial grade with sealer and lacquer finish.
  - 1. Required Emissions Classification:
    - a. No-Added Formaldehyde (NAF) and/or Ultra-Low Emitting Formaldehyde (ULEF) as approved by CARB.
  - 2. Acceptable Manufacturers and Products:
    - a. Flakeboard Company Limited; [www.flakeboard.com](http://www.flakeboard.com).
      - 1) Duraflake.
    - b. SierraPine; [www.sierrapine.com](http://www.sierrapine.com) - Encore.
    - c. Accepted substitute in accordance with Section 01 25 00.
  - 3. Thickness: 3/4-inch.
  - 4. Cabinet Interiors: Acrylic coated 45-47 pound density industrial particleboard.
  
- C. Medium-Density Fiberboard (MDF): ANSI A2.08.2.
  - 1. Grade: Grade 130 or better.
  - 2. Required Emissions Classification:
    - a. No-Added Formaldehyde (NAF) and/or Ultra-Low Emitting Formaldehyde (ULEF) as approved by CARB.
  - 3. Acceptable Manufacturers and Products:
    - a. Flakeboard Company Limited; [www.flakeboard.com](http://www.flakeboard.com).
      - 1) Premier MDF.
    - b. SierraPine; [www.sierrapine.com](http://www.sierrapine.com) - Medite II.
    - c. Accepted substitute in accordance with Section 01 25 00.
  - 4. Thickness: 3/4-inch unless indicated otherwise.
  
- D. Hardboard: ANSI A135.4. Tempered Grade.

## 2.03 HIGH PRESSURE LAMINATES (HPL)

- A. Basis of Design Manufacturers and Colors: See Finish Legend on Drawings.
  - 1. Panolam Industries International, Inc.; [www.panolam.com](http://www.panolam.com). Nevamar brand.
  - 2. Wilsonart LLC; [www.wilsonart.com](http://www.wilsonart.com).
  
- B. High Pressure Decorative Laminate: NEMA LD3, grades as indicated, or, if not indicated, as required by woodwork quality standards.
  - 1. Horizontal Surfaces: General Purpose Grade 10/HGS.
  - 2. Vertical Surfaces: May be Vertical Grade 55VGS.
  
- C. Colors: See Finish Legend on Drawings.

## 2.04 SOLID SURFACING

- A. Countertops: Section 12 36 61.

## 2.05 ADHESIVES

- A. Provide low VOC types as recommended by the manufacturer of the material being installed. Adhesives shall comply with SCAQMD Rule 1168 VOC limits.

## 2.06 HARDWARE AND ACCESSORY ITEMS

- A. Slides.
  - 1. TCMC Facilities Management Standard Manufacturer and Products:
    - a. Accuride International, Inc., [www accuride.com](http://www accuride.com).
    - b. 12-Inch to 28-Inch Drawer Slides: AC3017.
    - c. 12-Inch to 28-Inch Lateral File Slides: AC4032.
- B. Pull Handles:
  - 1. TCMC Facilities Management Standard Manufacturers and Products:
    - a. 4-Inch Handle Pulls: Fenny - FE1484 CH.
    - b. Flush Pulls: Knappe and Vogt Manufacturing – KV819 Anochrome.
- C. Door and Drawer Locks:
  - 1. TCMC Facilities Management Standard Manufacturer and Products:
    - a. Drawers: National Cabinet Lock – N8178-26-KD – Keyed Different – 7/8-inch cylinder.
    - b. Doors: National Cabinet Lock – N8178-26-KD – Keyed Different – 7/8-inch cylinder.
    - c. Doors: National Cabinet Lock – N8179-26-KD – Keyed Different – 1-3/8 inch cylinder.
    - d. Pin Tumbler Sliding Door Locks: National Cabinet Lock – N8142-26-KD – Keyed Different – Dull Chrome - 1-1/8 inch cylinder.
- D. Wire Management Grommets:
  - 1. TCMC Facilities Management Standard Manufacturer and Product:
    - a. ITW Plastiglide – P3RD+Color Code – 3”..
- E. Door Catches:
  - 1. TCMC Facilities Management Standard Manufacturers and Products:
    - a. Magnetic Catches: EPCO – EP1001.
    - b. Elbow Catches: IVES – IV2AM Aluminum.
- F. Connecting Screws:
  - 1. TCMC Facilities Management Standard Manufacturers and Products:
    - a. Hettich International.
    - b. Connector: HEVSH-B.
    - c. Screw: HEVSH-C.
- G. Adjustable Shelf Pilasters:
  - 1. TCMC Facilities Management Standard Manufacturer and Product:
    - a. Knappe and Vogt Manufacturing.
    - b. KV256AMNAT Aluminum Natural.
- H. Wood Shelf Standards:
  - 1. TCMC Facilities Management Standard Manufacturer and Products:
    - a. Reeve Store Equipment Company.
    - b. Single Slot: RVS40+Length.
    - c. Double Slot: RVS44+Length.
- I. Wood Shelf Supports with Angled Top:
  - 1. TCMC Facilities Management Standard Manufacturer and Products:
    - a. Reeve Store Equipment Company.

- b. Left: RVS81-L.
  - c. Center: RVS81-C.
  - d. Right: RVS81-R.
2. Description: Heavy duty, self-locking nylon or steel, designed for installation in pre drilled holes in cabinet ends and vertical partitions, designed to prevent the shelf support from rotating. No exceptions.

J. Casters:

- 1. TCMC Facilities Management Standard Manufacturer and Products:
  - a. Faultless.
  - b. Swivel: FL121-2.5 - 2 1/2".
  - c. Rigid: FL521-2.5 - 2 1/2".

K. Closet Tubing:

- 1. TCMC Facilities Management Standard Manufacturer and Products:
  - a. Knappe and Vogt Manufacturing.
  - b. Chrome Look Tubing: KV750-5+Length.
  - c. End Cap: KV732.
  - d. 1-5/16 Inch U-Shaped Flange: KV735.
  - e. 1-5/16 Inch Round Closed Flange: KV764.

L. Hinges: 5 knuckle 2-1/4 inch, overlay type, hospital tip, 0.095-inch thick steel with dull chrome, finish.

- 1. Acceptable Manufacturers:
  - a. Blum, Inc.; [www.blum.com](http://www.blum.com).
  - b. Grass America, Inc.
  - c. Häfele America Co.
  - d. Hettich America LP.
  - e. Mepla, Inc.
  - f. Accepted substitute in accordance with Section 01 25 00.
- 2. Hinges shall have a minimum of eight (8) edge and leaf fastenings.
- 3. Doors 48 inches and over in height shall have three (3) hinges per door. Doors 66 inches and over shall have four (4) per door.

M. Drawer Stops: All regular drawers shall be equipped with two drawer stops attached to the cabinet ends. The cabinet drawer stops shall be metal with attached rubber bumper and be installed to prevent the drawer face from touching the cabinet ends edges when the drawer is in a closed position.

N. Index Followers and Label Holders for File Drawers: Steel plate and rod type Pendaflex file racks and label holders for all file drawers.

O. Exposed Hardware Finish: Comply with BHMA A156.18.

## 2.07 COUNTER AND CABINET FABRICATION

- A. General: Fabricate plastic laminate faced casework to dimensions, profiles and details shown. Assemble units in the shop in as large of components as practicable to minimize field cutting and jointing. All joints to be doweled and glued. All edge banding called for in this Section shall be 3mm PVC hot melt glue applied. Top edges of interior drawer boxes may be 1/2mm hot melt glue applied.
- 1. Plastic Laminate Faced Cabinets: Comply with Section 10 of AWS Standards for Custom Grade.
  - 2. Provide and install hardware as indicated and specified.

- B. Preparation: Obtain field measurements and verify dimensions are as indicated on shop drawings before fabricating casework.
- C. Coordination: Coordinate with plumbing and electrical rough-in.
- D. Core Material: As indicated on Drawings. Fabricate panels with plastic laminate on both sides or balancing sheet on concealed faces.
  - 1. Particle Board: Minimum density 45 lb. particle board, minimum 3/4-inch thick before lamination.
  - 2. Plywood: Commercial Standard Good Grade, minimum 3/4-inch thick before lamination.
  - 3. MDF: Minimum 3/4-inch thick before lamination.
- E. Cabinet Joinery: Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels for 24-inch deep cabinets and a minimum of four (4) dowels for 12-inch deep cabinets. All dowels are to be hardwood laterally fluted, with chamfered end and a minimum diameter of ten (10) millimeters. Dowels with less than 10mm diameter are not acceptable. Internal cabinet components such as fixed horizontals, rails and verticals are to be doweled in place. Dowels are to be securely glued and cabinets clamped under pressure during assembly to assure secure joints and cabinet squareness.
- F. Bases: All base and tall units shall have an integral base. Rubber or vinyl base covering will be furnished and applied under other sections.
- G. Cabinet Top and Bottom: Full sub tops (rails not acceptable) and bottoms shall be particleboard, 3/4-inch thick, laminated on the interior with low pressure laminate cabinet liner with a backer sheet of a neutral color on the unexposed surface. The interior surface of sink cabinet bottoms shall be laminated with high pressure laminate cabinet liner. The bottom surface of all upper cabinets shall be low pressure laminate cabinet liner. Front edges to be 3mm PVC edging (laminate not acceptable). All tops shall be solid except for sink base tops which shall have a 1-inch by 1-inch by 1/8-inch angle iron front rail. All cabinets over 42 inches and up to 72 inches in height shall be supplied with a finished 3/4-inch continuous top.
- H. Cabinet Ends: Unexposed cabinet ends shall be particleboard, 3/4-inch thick, laminated on the interior with low pressure laminate cabinet liner and a backer sheet of a neutral color on the exterior unexposed surface. Exposed cabinet ends shall be laminated with vertical surface cabinet liner, Light Beige or Dove Grey color, on the interior. Holes shall be drilled for adjustable shelf clips 32mm (1-1/4-inch) on center. Front edges to be banded with 3mm PVC edging (laminate is not acceptable). Bottom edges of wall cabinet ends to be banded with 3mm PVC edging (laminate not acceptable). Ends to be bored to accept doweled top and bottom. All ends to be rabbeted to accept recessed back.
- I. Fixed Intermediate and Adjustable Shelves: Particleboard, 3/4-inch thick unless otherwise indicated, laminated on both sides with low pressure laminate cabinet liner (closed door cabinets). Color shall be Light Beige or Dove Grey on both surfaces. Front edges to be banded with 3mm PVC edging. Adjustable shelves up to 30 inches wide are 3/4-inch thick. Shelves wider than 30 inches are 1-inch thick. Open shelf unit cabinet shelves to be laminated with high pressure decorative laminate.
- J. Cabinet Back: Standard recessed cabinet back to be 1/4-inch thick prefinished hardboard. Color to match cabinet interior. All sink cabinets to have split back, removable from inside. Exposed exterior back on fixed or movable cabinets to be particleboard, 3/4-inch thick, laminated with high pressure laminate on the exterior surface and Light Beige or Dove Grey colored high pressure laminate cabinet liner on the interior surface. Interior back surface on open wall cabinets to be high pressure decorative laminate.

- K. Cabinet Doors and Drawer Fronts: Particleboard, 3/4-inch thick, shall be laminated with vertical surface high pressure laminate on the exposed surface and colored high pressure laminate cabinet liner on the interior surface. Door and drawer edges to be banded with 3mm PVC edge banding, hot melt glue applied. Double doors shall be used on all cabinets in excess of 24 inches in width.
- L. Drawers: Sides, back and subfront, shall be particleboard, 1/2-inch thick, laminated with colored polyester laminate. The back and subfront shall be doweled and glued into the sides. No staples or nails permitted. Dowels shall be spaced 32mm (1-1/4-inch). Dowels to be hardwood, laterally fluted, with chamfered ends and a minimum diameter of eight (8) millimeters. Top edge to be banded with PVC edging. Drawer bottom to be Light Beige or Dove Grey color, 1/4-inch thick, prefinished hardboard, let into subfront, sides and back. Paper storage drawers to be heavy duty 3/4-inch particleboard construction with 100 pound full extension slides, plywood reinforcement stiffener at bottom and a retaining hood at the rear of each drawer.
- M. Exposed Edges: Exposed cabinet body edges shall be covered with PVC edge-banding. Plastic laminate is not acceptable for cabinet body edges. Door and drawer front edges shall be covered with 3mm PVC edge-banding. Minimum of 4 colors available for PVC edge-banding including light Beige, Black, Brown and Dove Grey. PVC edge-banding must be applied with hot melt glue, no exceptions.
- N. Plastic-Laminate-Clad Tops:
  1. Particleboard: Medium density (45 lbs./cu. ft.) wood chip and phenolic resin binders, compressed board, 1-inch thick.
  2. Plastic Laminate: Comply with NEMA LD3; type, thickness, color, pattern and finish as indicated for each application; use NEMA Type 2, 0.050-inch thickness, colors, patterns, finishes as indicated on Finish Key, maximum 5 colors. Underside to be laminated with balance sheet.
  3. All exposed edges of countertop to be trimmed with 3mm PVC edge banding, 1-inch thick, hot melt glue applied.
  4. Sinks: Provide cutouts for sinks as required. Coordinate with Division 22.
  5. Electrical Devices: Provide for and coordinate with Division 26.
  6. Splashes and Post Formed and Rolled Edges Countertops: Provide covered hardwood support molding continuous the entire length along the inside corner formed by the top and backsplash.
  7. Grommets: Locate grommets centered 3 inches from the backsplash of counter, spaced directly above outlets and communications connections.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions:
  1. Layout: Verify layout of work before beginning installation.
  2. Existing Conditions: Examine before beginning installation.
- B. Notification: Notify General Contractor of unsatisfactory conditions in writing with a copy to Architect.
- C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### **3.02 PREPARATION**

- A. Field Measurements: Field measure spaces to receive casework before beginning fabrication.

### 3.03 ARCHITECTURAL WOODWORK INSTALLATION

- A. Lengths: Wherever possible, provide single piece for each length of finish. Butt joints not allowed except for long pieces or room length moldings which may be in two or more sections. When butt joints are necessary, bevel joints.
- B. Install interior finish level, plumb and true.
- C. Securing: Tightly secure to bracing with nails, screws, glue etc. Blind nail wherever possible. Where surface nailing is necessary, use finish nails carefully set with nail punch.
- D. Trim Finishing Against Walls or Ceiling: Mill with extra width and scribe to wall or ceiling at job.
- E. Edges: Except where molded, mill trim with square edges. After erection, slightly round exposed edges by sanding as directed.
- F. Replacement: Replace any interior finish bearing hammer marks, splits, cracks, mars or defects of any nature.
- G. Touch-up shop finish after installation.

### 3.04 COUNTER AND CABINET INSTALLATION

- A. General: Set casework accurately in place, level and secure to floor walls. Provide connecting and attaching devices, closures and trim members as required. Install items complete. Scribe and closely fit casework to adjacent work.
- B. Counters: Construct supports for counters as indicated.
  - 1. Securely attach counters to walls plumb and level.
  - 2. Electrical Devices: Provided and installed under other sections.
  - 3. Simulated Stone Countertops: Installed under Section 12 36 61.
- C. Cabinets:
  - 1. Bases: Construct cabinet bases for cabinets as indicated and securely anchor to floor.
  - 2. Cabinets: Securely attach cabinets to bases and walls with cabinets plumb and level and hardware operating properly.
  - 3. Base: Provided on base cabinets as scheduled after cabinets are set in place.

### 3.05 ADJUSTING AND CLEANING

- A. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Repair or remove and replace defective work as directed upon completion of installation.
- C. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
- D. Protection: Advise Contractor of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner.

END OF SECTION

## DIVISION 07 – THERMAL AND MOISTURE PROTECTION

### SECTION 07 02 50

#### CUTTING AND PATCHING MEMBRANE ROOFING

##### PART 1 GENERAL

###### 1.01 SUMMARY

- A. Section Includes:
  - 1. Patching and flashing existing roofing and insulation around new roof openings.
  - 2. Patching existing roofing and insulation where existing roof openings are closed in.

###### 1.02 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Prior to starting the roofing, the applicator shall submit to the Architect through the General Contractor copies of the manufacturer's specifications covering materials proposed for application.

###### 1.03 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Certificates: Submit evidence of certified applicator status for roofing product proposed for application.

###### 1.04 CLOSEOUT SUBMITTALS

- A. Procedures: Submit for Project Record in accordance with Section 01 78 00.
- B. Warranties: At completion of the Project, submit roofing and flashing warranties as specified.

###### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Employ original roofing subcontractor or other qualified subcontractor authorized to make revisions to existing roofing without affecting or limiting original warranty, guarantee or bond.

###### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Section 01 60 00.
- B. Delivery: Deliver materials in manufacturer's original, unopened containers with labels intact and legible.
- C. Storage and Protection: Handle rolled goods to prevent damage to edges or ends. Store rolled goods on end. Store off the ground and keep covered with waterproof covering. Materials that become wet will be subject to rejection.

## 1.07 AMBIENT CONDITIONS

- A. Do not apply roofing during wet weather or when the ambient temperature is below 35 degrees F.

## 1.08 WARRANTY

- A. Existing Roof Warranty: Submit evidence that existing roof warranty has not been voided by patching.
- B. New Warranty: Roofing subcontractor shall provide and deliver a warranty against defects in materials and workmanship in patched roofing and flashings for a period of two years from completion of work.

## **PART 2 PRODUCTS**

### 2.01 MATERIALS

- A. Roofing System: Match existing.
- B. Insulation System: Match existing.
- C. Flashings: Match existing with system compatible with roofing.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. General: Verify that work of other trades that penetrates roof deck has been completed. Examine surfaces for inadequate anchorage, drainage, foreign material, moisture and unevenness that would prevent the execution and quality of application of roofing system. Do not proceed with application of roofing system until defects are corrected.
- B. Acceptance: No roofing shall proceed until the surface to be covered is fully acceptable to the applicator.

### 3.02 PREPARATION

- A. Protection: Protect paving and building walls adjacent to hoist prior to starting work with protective covering. Lap suitable protective covering materials at least 6 inches. Secure protective coverings against wind. Leave protective covering in place for duration of roofing work.
- B. Surface Preparation: Dry and broom clean before beginning work.

### 3.03 APPLICATION

- A. Insulation: Install to match existing where required for patching. Install sloping crickets where required to maintain drainage around new openings. Install no more insulation at one time than will be protected from rain or snow by installation of roofing membrane or flashings on the same day or prior to storm. Install temporary water cutoffs at completion of each day's work and remove upon resumption of work.



- B. Membrane Roofing: Install in accordance with approved manufacturer's specifications. Complete installation of roofing system up to line of termination of day's work. Seal all felts at eaves, valleys and flashing with roofer's mastic and fabric prior to installation of sheet metal.
- C. Base Flashing: Install in accordance with approved manufacturer's specifications and as detailed. Extend base flashing a minimum of 8 inches up vertical surface.
- D. Record of Work: The Contractor shall keep a record indicating temperature and moisture conditions and the type and location of work being done during each day of roofing operation.

#### 3.04 CLEANING

- A. Upon completion, remove bitumen, asphalt and gravel from roof drains and scuppers and from exposed sheet metal and masonry surfaces, gutters, etc.

END OF SECTION



## SECTION 07 84 00

### FIRESTOPPING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Penetration firestopping, fire-resistant joint sealants, fire safing, and smoke seals as indicated on the Drawings as well as the following areas:
    - a. All openings in fire-rated floors and walls both empty and those accommodating penetrating items such as cables, cable trays, conduits, pipes, ducts, etc.
- B. Related Requirements:
  - 1. Joint Sealants: Section 07 92 00.
  - 2. Mechanical and Electrical Work: Divisions 21 through 28.

##### 1.02 REFERENCES

- A. Guide References and Standard Practices: Comply with recommendations of the following unless otherwise specified.
  - 1. ASTM E2174-09 – Standard Practice for On-Site Inspection of Installed Fire Stops.
  - 2. ASTM E2393-09 – Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
  - 3. FCIA Firestop Manual of Practice.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit Manufacturer's printed product data indicating product characteristics, performance and limiting criteria for each product proposed for use.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Installation Instructions: Submit Manufacturer's installation instructions for each type of firestop required by the Project.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Procedures: Submit the following in accordance with Section 01 78 00.
- B. Documentation: Compile and submit forms identifying products and technical parameters of each firestop installation performed, including manufacturer's details of the system selected for the application.

##### 1.06 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Firestopping shall be performed by a contractor trained or approved by firestop manufacturer.

- B. Mock-Up: Prepare job mock-up of each system proposed for use in the Project as directed by Architect. Approved mock-ups may be left in place as part of the finished Project and will constitute the standard for remaining work.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver all materials in original unopened packages fully identified with Manufacturer's name, trade name and UL label.
- B. Storage and Handling Requirements: Materials shall be stored off the ground and protected from environmental conditions as required by Manufacturer.

#### 1.08 AMBIENT CONDITIONS

- A. Conform to Manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.
  - 1. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.
- B. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

#### 1.09 WARRANTY

- A. Firestop Installer shall warrant that firestopping systems used meet firestopping requirements as herein specified.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS AND PRODUCTS

- A. Acceptable Firestopping Manufacturers and Systems:
  - 1. 3M Fire Protection Products.
  - 2. A/D Fire Protection Systems; [www.adfire.com](http://www.adfire.com), division of the Carbolite Company – A/D Firebarrier,
  - 3. Hilti Corporation; [www.us.hilti.com](http://www.us.hilti.com) - Hilti Firestop Systems.
  - 4. Nelson FireStop Products; [www.nelsonfirestop.com](http://www.nelsonfirestop.com).
  - 5. The RectorSeal Corporation; [www.rectorseal.com](http://www.rectorseal.com) – Metacaulk Firestopping Products; [www.metacaulk.com](http://www.metacaulk.com).
  - 6. Specified Technologies, Inc. (STI); [www.stifirestop.com](http://www.stifirestop.com).
  - 7. Tremco Fire Protection Systems Group of Tremco Incorporated; [www.tremcofirestop.com](http://www.tremcofirestop.com), - TREMstop.
- B. Basis of Design Fire Safing Manufacturer and Product: Thermafiber, Inc.; [www.thermafiber.com](http://www.thermafiber.com) - Thermafiber Safing Insulation.
  - 1. Size: As required by fire rating and conditions.
  - 2. Accessories; Provide Thermafiber Safing Clips as required.
- C. Substitution Requests: In accordance with Section 01 25 00.

#### 2.02 FIRESTOPPING SYSTEMS DESIGN

- A. Types of firestop to be used for each condition shall be the responsibility of the installer and shall comply with all specified regulatory requirements.

- B. Provide a Flame (F) and Temperature (T) rating of at least one (1) hour but not less than the fire resistance rating of assembly being penetrated, as tested per ASTM E814.
- C. Firestop contractor shall immediately notify the Architect if the firestopping systems herein specified cannot meet the requirements of the specification.

## 2.03 MATERIALS

- A. Regulatory Requirements: Firestopping materials proposed for use on this Project shall conform to both Flame (F) and Temperature (T) ratings as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests. The F rating and T rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. The fire test shall be conducted with a minimum positive pressure differential of 0.03 inches of water column.
- B. General Requirements for Firestopping Materials:
  - 1. Materials shall be free of asbestos.
  - 2. Firestop materials in exposed areas shall be compatible with specified finishes.
  - 3. Materials shall conform to all applicable governing codes.
  - 4. All materials shall be compatible with the material penetrating the fire assembly.
  - 5. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
  - 6. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
  - 7. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
  - 8. Use sealants that comply with the limits for VOC content according to SCAQMD Rule #1168:
    - a. Sealants: 250 g/L.
    - b. Sealant Primers for Nonporous Substrates: 250 g/L.
    - c. Sealant Primers for Porous Substrates: 775 g/L.

## 2.04 ACCESSORIES

- A. Furnish all accessory materials such as fire safing batts, sleeves, sheet metal, sealants, etc. necessary to complete fire stopping systems unless furnished by others.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Existing Conditions: Contractor shall inspect and verify that the surface and condition of the substrates and all sleeves or blockouts furnished by others have no defects or errors that would interfere with the installation of the firestopping materials.
- B. Notification: Notify Architect in writing of any defects or errors in workmanship. Do not proceed with work until all unsatisfactory conditions have been corrected.
- C. Acceptance: Start of installation of firestopping shall constitute the Contractor's acceptance of surfaces and conditions of substrates, sleeves and blockouts.

### 3.02 PREPARATION

- A. Clean surfaces and substrates of dirt, oil, loose materials and other foreign materials that may affect the proper bond or installation of the firestops in strict accordance with Manufacturer's written instructions.
- B. Provide primers as required which conform to Manufacturer's recommendations for various substrates and conditions.
- C. Do not apply firestops to surfaces previously painted or treated with a sealer, curing compound, water repellent or other coating unless tests have been performed to ensure compatibility of materials. Remove coatings as required in compliance with Manufacturer's instructions.
- D. Mask where necessary to protect adjoining surfaces.

### 3.03 INSTALLATION

- A. Install in strict accordance with Manufacturer's printed instructions to provide a Flame (F) and Temperature (T) rating of at least one (1) hour but not less than the fire resistance rating of the assembly being penetrated.
  - 1. Equipment used shall be in accordance with firestop manufacturer's written installation instructions.
- B. Ensure that all accessories such as anchoring devices, back-up materials, clips, sleeves, supports and other materials used in the actual fire test are installed.
- C. Install firestops with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal.
- D. Tool or trowel exposed surfaces. Remove excess firestop material promptly as work progresses and upon completion.
- E. Following each installation, apply a label on or adjacent to each penetration firestop and at regular intervals along each fire-resistive joint sealant application. Label shall identify and document firestopping system installed in accordance with FCIA Firestop Manual of Practice.

### 3.04 SITE QUALITY CONTROL

- A. Firestop contractor shall examine completed firestops to ensure proper installation and full compliance with this specification.
- B. All areas of work must be accessible until inspection by the applicable code authorities.

### 3.05 ADJUSTMENT

- A. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

### 3.06 CLEANING

- A. When finished work will be visible, clean adjacent surfaces in accordance with Manufacturer's printed instructions. Remove excess material and stains on surfaces as required.
- B. If visible in the finished work, remove temporary dams after initial cure of firestops.

- C. Correct staining and discoloring on adjacent surfaces.
- D. Remove all debris and excess materials entirely from site and leave work in a neat and clean condition.

END OF SECTION





## SECTION 07 92 00

### JOINT SEALANTS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Work Results: Providing all caulking and sealant indicated on Drawings, specified herein, and not specified under other sections. In general, seal all openings indicated on Drawings and at other locations requiring sealant to seal visually and against infiltration from air and water, or to provide acoustical isolation, including but not limited to following:
  - 1. Joints at penetrations of non-fire rated walls, decks and floors by piping and other service and equipment.
  - 2. Joints between items of equipment and other construction.
  - 3. Joints between door frames and adjacent materials.
  - 4. Open joints between similar or dissimilar materials as required to close and conceal jointing of the work.
  - 5. Joints at sound-insulated partitions.
  - 6. Other joints as indicated.
- B. Related Requirements:
  - 1. Firestopping: Section 07 84 00.
  - 2. Glazing Sealants: Section 08 80 00 Glazing.

##### 1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate installation of sealants with other construction trades.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit for each material and location of application.
- C. Samples: Submit for each type of sealant for color selection.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Warranty: Submit in accordance with Section 01 78 00.

##### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer: Company specializing in sealant application. Separate subcontractor is required.
    - a. Experience: Continuously installed sealants in State of California for five years.
  - 2. Manufacturer's Technical Representative: Obtain materials only from manufacturers who will, if required, send qualified technical representative to Project site, for purpose of advising installer of proper procedures and precautions for use of materials.
- B. Certifications:
  - 1. Elastomeric Sealants: Listed by SWRI on SWR Institute Validation Program Validated Products List; [www.swrionline.org](http://www.swrionline.org).

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
  - 1. Protect materials from excessive moisture in shipment, storage, and handling.
- B. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying material name and manufacturer, production date and/or product code.
- C. Storage and Handling Requirements:
  - 1. Storage: Store materials in a clean, dry area not subject to extreme heat or cold in accordance with manufacturer's instructions.
  - 2. Handling: Protect materials during handling and installation to prevent damage.

## 1.07 AMBIENT CONDITIONS

- A. Do not apply exterior sealants during wet weather or when outside temperature is below 40 degrees F or apply interior sealants when inside temperature is below 60 degrees F.

## 1.08 WARRANTY

- A. Warranty: Provide three year written warranty covering materials and installation for sealants in accordance with Section 01 78 00.
  - 1. Warranty: Require installer, at no cost to Owner, to repair or replace sealants which fail to perform as airtight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, color retention, or general durability; or appear to deteriorate in any manner not clearly specified as inherent quality of material by submitted manufacturer's data.

## **PART 2 PRODUCTS**

### 2.01 PRODUCT OPTIONS

- A. Substitution Requests: Required for all manufacturers and products not named as Acceptable or as Basis of Design, excepting types for which no manufacturer is named.
  - 1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  - 2. During Construction Phase: Submit in accordance with Section 01 25 00.

### 2.02 MATERIALS, GENERAL

- A. Low-Emitting Material Requirements: Use sealants that comply with the following limits for VOC content when calculated according to SCAQMD Rule #1168:
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.

### 2.03 LATEX JOINT SEALANTS

- A. Interior Caulk and Sealants for Under Thresholds and Non-Moving Joints: Acrylic latex, ASTM C834-10.

## 2.04 ELASTOMERIC JOINT SEALANTS

- A. Acceptable Manufacturers:
1. Polyurethane Sealants:
    - a. BASF; [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com), Sonolastic brand.
    - b. Geocel Engineered Polymers.
    - c. Pecora Corporation; [www.pecora.com](http://www.pecora.com).
    - d. Sika Corporation; [www.usa.sika.com](http://www.usa.sika.com).
    - e. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
  2. General Construction Sealants:
    - a. BASF; [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com), Sonneborn brand.
    - b. DAP Incorporated.
    - c. Pecora Corporation; [www.pecora.com](http://www.pecora.com).
    - d. Sika Corporation; [www.usa.sika.com](http://www.usa.sika.com).
    - e. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
  3. Silicone Sealants:
    - a. General Electric.
    - b. Dow Corning; [www.dowcorning.com](http://www.dowcorning.com).
    - c. Pecora Corporation; [www.pecora.com](http://www.pecora.com).
    - d. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
  4. Fire-Resistant Sealants:
    - a. BASF; [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com), Sonneborn brand.
    - b. DAP Incorporated.
    - c. Pecora Corporation; [www.pecora.com](http://www.pecora.com).
    - d. Sika Corporation; [www.sikaconstruction.com](http://www.sikaconstruction.com).
    - e. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
- B. Sealant Materials and Applications:
1. Exterior Vertical and Overhead Joints Not Specified Otherwise: Two-component polyurethane, ASTM C920, Type M, Grade NS, non-sag, Class 50, Use NT.
  2. Sealant at Lavatories, Tubs and Showers: Silicone tub sealant.
- C. Primer: As recommended by sealant manufacturer.
- D. Colors: As selected by Architect from standard colors.

## 2.05 ACOUSTICAL JOINT SEALANTS

- A. Acceptable Manufacturers: Following manufacturers are acceptable for applications as specified below.
1. Pecora Corporation; [www.pecora.com](http://www.pecora.com).
  2. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
  3. United States Gypsum Co; [www.usg.com](http://www.usg.com).
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
1. Acceptable Products – Non-Fire Rated Partitions and Ceilings:
    - a. Pecora Corp. - AC-20 FTR Acoustical and Insulation Sealant. Acrylic latex type.
    - b. Pecora Corp. – AIS-919 Acoustical and Insulation Latex Sealant.
    - c. Tremco, Inc. – Tremflex 834 Siliconized Interior Acrylic Latex Sealant.
    - d. United States Gypsum Co. - SHEETROCK Brand Acoustical Sealant.
  2. Acceptable Products –Fire Rated Partitions and Ceilings:
    - a. Pecora Corp. - AC-20 FTR Acoustical and Insulation Sealant. Acrylic latex type.

- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
  - 1. Acceptable Products:
    - a. Tremco, Inc. - Tremco Acoustical Sealant.

## 2.06 NON-RATED JOINT BACKING MATERIAL

- A. Acceptable Manufacturers:
  - 1. BASF; [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com) – Sonolastic.
  - 2. Backer Rod Manufacturing Inc.; [www.backerrod.com](http://www.backerrod.com) - Denver Foam.
  - 3. Dow Chemical Company - Ethafoam.
- B. Material: Closed cell polyethylene foam.
- C. Shape: Round rod or semi-circular type.
- D. Size joint backing material for minimum 30 percent compression when inserted in joint.

## 2.07 FIRE-RATED JOINT BACKING MATERIAL

- A. Acceptable Manufacturers and Products:
  - 1. Backer Rod Mfg. Inc., Denver, Colorado - Ultra Block.
- B. Size: As required for joint width.

## 2.08 BOND BREAKER TAPE

- A. Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Comply with Section 01 71 16:
  - 1. Inspect joints to be sealed to application of any work under this section.
- B. Notification: Notify General Contractor of any joints which cannot be put into proper condition to receive sealants in writing with copy to Architect.
- C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### 3.02 PREPARATION

- A. Preparation of Surfaces:
  - 1. Clean surfaces in accordance with manufacturer's recommendations.
  - 2. Mask edges, if required, to protect adjoining surfaces and produce a straight finish line.
  - 3. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances that would interfere with bond of sealant.
  - 4. Do not proceed with installation of sealant over joint surfaces that have been painted, lacquered, waterproofed or treated with water repellent or other treatment of coating. Remove coating or treatment joint surfaces before installing sealant.

5. Etch concrete masonry joint surfaces to remove excess alkalinity unless sealant manufacturer's printed instruction indicated that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid, neutralize with diluted ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- B. Priming: If required, prime surfaces which are to be sealed with manufacturer's recommended or standard primer, after surfaces have been prepared as specified. Before use, check primers for discoloration and dirt pick-up on adjacent surfaces. If staining occurs, after exposure, take adequate measures to prevent primer from being applied over face of adjacent porous materials by masking or other suitable measures.
- C. Joint Backing:
1. Joints: Depth necessary to provide for specified allowable thickness of sealant and also required backing where and as specified. Provide backing of extent and type as specified and required to provide for allowable depth of sealant.
  2. Back-up Materials for Sealants: Non-staining, compatible with sealant and primer. resilient nature, and as recommended by manufacturer of sealant.
    - a. Size and Shape: As required by width of joint and specified.
    - b. Do not use materials impregnated with oil, solvents or bituminous materials.
  3. Compress backing material minimum of 30 percent when inserted in joint. Backing material for upper portion of joints shall be round rod or semi-circular in cross-section where in contact with sealant.
- D. Bond Breaker Tape: Install where indicated and as required by manufacturer's recommendations to ensure that sealants will deform properly.

### 3.03 APPLICATION

- A. Joint Sealing, General:
1. Apply sealants in continuous beads without open joints, voids or air pockets, using ratchet hand gun or mechanical powered gun.
  2. Confine sealants to joint areas with masking tapes or other precautions. Apply compounds in concealed compression joints accurately so that excess compound will not extrude from joints.
  3. Remove excess compound or sealant promptly as work progresses, and clean adjoining surfaces.
  4. In rough surfaces or joints of uneven widths, install sealant well back into joint. Recess equal to width of joint, or 3/8-inch minimum at masonry.
  5. Use anti-tack agent where necessary to protect freshly applied sealant from public traffic and dirt.
  6. Slightly recess joints to facilitate painter's line. Handtool and finish joints throughout construction.
  7. Comply with manufacturer's specifications and recommendations.
- B. Workmanship: Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.
1. Except as otherwise indicated, fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces.
  2. Where horizontal joints are between horizontal surface and vertical surface, fill joint to form slight cove, so that joint will not trap moisture and dirt.

- C. Joint Sizes: Install sealants to depths as indicated or, as recommended by sealant manufacturer but within following general limitations:
  - 1. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.
  - 2. For joints sealed with non-elastomeric sealants and calking compounds. fill joints to depth in range of 75 percent to 125 percent of joint width.
- D. Spillage:
  - 1. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or sealant.
  - 2. Remove excess and spillage of compounds promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage. Do not damage adjoining surfaces or finishes.
- E. Sinks, Lavatories and Showers: Fill joints between dissimilar materials with silicone sealant.

### 3.04 ACOUSTICAL SEALANT APPLICATION

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Install materials to comply with sound control requirements noted on Drawings.
- C. Use a caulking-type gun, apply 1/4-inch minimum round bead of sealant (1/2-inch maximum) to seal perimeter of each sound-insulated partition.
- D. Seal sound-insulated partitions on both sides where facings abut dissimilar materials; around perimeter, in the angle formed by panels and abutting dissimilar materials; at all intersections; at all panel terminations in door and window frames; and at control joint locations before attaching the control joint to the panels. Apply continuous beads of sealant around all openings formed for outlets, lights, etc. Completely butter the outside of electrical boxes.
  - 1. Caulk ductwork penetrations.
- E. Cut gypsum panels with 1/8-inch maximum relief at perimeter to receive sealant. Install before sealant skins.

### 3.05 CURING

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

### 3.06 SITE QUALITY CONTROL

- A. Field Samples: Where directed by Architect, cut out and remove total of three samples consisting of undisturbed sealant and back-up material from joint. Samples shall be 6 inches in length. Reseal cut out areas with same materials.

### 3.07 CLEANING

- A. Clean soiled surfaces immediately.
- B. Replace any damaged material that cannot be cleaned with new material.

### 3.08 PROTECTION

- A. Advise General Contractor of procedures required for protection of sealants during construction period, so that they will be without deterioration or damage (other than normal weathering) at time of acceptance.

END OF SECTION





## DIVISION 08 - OPENINGS

### SECTION 08 12 13

#### HOLLOW METAL FRAMES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Hollow metal door frames.
  - 2. Hollow metal window frames.
- B. Related Requirements:
  - 1. Wood Doors: Section 08 14 00.
  - 2. Hardware including Thresholds and Weatherstripping: Section 08 71 00 Door Hardware.
  - 3. Glazing: Section 08 80 00.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. ANSI A115 - Specifications for Door and Frame Preparation for Hardware.
  - 2. National Fire Protection Association - NFPA 80 - Standard for Fire Doors and Other Opening Protectives, 2010 Edition.
- B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
  - 1. ANSI/HMMA 840-07 – Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.
  - 2. ANSI/NAAMM HMMA 861-06 – Guide Specifications for Commercial Hollow Metal Doors and Frames.
  - 3. NAAMM Hollow Metal Manual.

##### 1.03 COORDINATION

- A. Templates: Hardware templates for hardware mounted on hollow metal work shall be submitted under Section 08 71 00 directly to hollow metal manufacturer immediately after acceptance of hardware schedule. Report failure to receive templates with reasonable promptness to General Contractor.

##### 1.04 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Shop Drawings: Submit drawings indicating dimensions, layout and anchorage details of all hollow metal frames.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Submit the following in accordance with Section 01 78 00.
  - 1. Fire Door and Frame Assemblies: Submit documentation for Owner's records of initial inspection and approval of fire door assemblies by inspector for authority having jurisdiction.

## 1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Fire Rating: Provide fire rating label acceptable to local building code authority on frames indicated on the door schedule. If any frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, advise Architect prior to submission of bids.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Store frames in manner to prevent twisting.

## PART 2 PRODUCTS

### 2.01 HOLLOW METAL FRAMES

- A. General: Frames for hollow metal and wood doors, entrances, windows and borrowed lights, etc. indicated to be hollow metal shall be of design sections as detailed and assembled as indicated.
- B. Gages:
  - 1. Frames on Interior Walls: 16 gage steel.
  - 2. Loose Glazing Beads: Not less than 20 gage steel, corners butted.
- C. Construction: Construct frames encompassing one or more doors with sidelights or transoms, and steel window walls, etc., in rigid units of as large size as practical to reduce to minimum number of job-fabricated joints.
  - 1. Joints and Connections Including Job-Fabricated Joints: Welded and ground and entire assembly reinforced and braced as required to ensure absolute rigidity.
  - 2. Provide expansion joints as indicated or required.
  - 3. Where so indicated or as required, provide channel stiffening within and securely welded to frame member.
  - 4. Do not use exposed screws except where specifically accepted.
- D. Accessories:
  - 1. Reinforcement for Hardware: Machine frames for attachment of hardware, including mortising, reinforcing, drilling and tapping for hinges.
    - a. Butt Hinges: Seven gage, 12 inches long.
    - b. Closers: 10 gage, 12 inches long, full width of frame or equivalent.
    - c. Strikes, Flush Bolts and Other Surface Mounted Hardware: 12 gage or equivalent.
  - 2. Anchors: Furnish anchors of type and number required for anchoring frames to structure, partitions, etc. as follows:
    - a. Three jamb anchors on seven foot high jamb.
    - b. Four jamb anchors on jambs over seven feet.Wire anchors will not be allowed. Provide such installation instructions as are necessary to ensure proper installation of anchors.
  - 3. Silencers: Drill stop of lock jamb of each interior frame for installation of pneumatic rubber door silencers. Silencers shall be furnished under Section 08 71 00, numbers as indicated on schedule.
  - 4. Joints: Conceal welded joints in two-sided mullions or similar sections behind glazing stops. Continuous weld and grind smooth exposed joints.

5. Glazing Stops: Provide removable metal stops, screwed to frame, at borrowed lights and window walls. See Section 08 80 00 for glazing clearance requirements.
  - a. Unless indicated otherwise, glazing stops shall be 5/8-inch x 3/4-inch or 3/4-inch x 3/4-inch cold-rolled channel, shaped as required or detailed and hand fitted to each opening.
  - b. Butt Joints: Square and true and tightly fitted.
  - c. Fasten to frame with metal screws 18 inches on center, flathead, countersunk. Do not over-tighten to cause indentations or puckering at screws. Use vandalproof screws at exterior stops.
- E. Hinges: Install mortar protection box behind each hinge cut.

## 2.02 FINISH

- A. Cleaning and Primer:
  1. Thoroughly clean surfaces of grease, rust and scale to insure paint adherence. Apply filler to doors where required to produce a smooth surface.
  2. Apply one coat of baked-on factory primer.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Set steel frames accurately in accordance with details, straight and free of twist with head level and jambs plumb. Rigidly anchor to walls and partitions and securely brace until surrounding work is completed. Provide deflection clearances at frame heads where indicated.
- B. Fire-Rated Door and Frame Assemblies: Install in compliance with NFPA 80.
  1. Make no field modifications to door assembly that void the label.
- C. Field Welds: Make welds full length of joints. Remove splatter and grind exposed welds to match adjacent surfaces. Provide Architect with ample notice to review welds before finish operations begin.
- D. Wherever possible leave spreader bars in place until frames are securely anchored.
- E. Jambs shall be filled with grout where frames occur in concrete or masonry walls.

END OF SECTION



## SECTION 08 14 00

### WOOD DOORS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Flush wood doors.
  - 2. Factory prefitting and premachining.
  - 3. Factory finishing.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Glazing stops.
- C. Related Requirements:
  - 1. Hollow Metal Door Frames: Section 08 12 13.
  - 2. Hardware: Section 08 71 00 Door Hardware
  - 3. Glazing: Section 08 80 00 Glazing.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. ANSI/HPVA HP-1-2009 - American National Standard for Hardwood and Decorative Plywood.
  - 2. ANSI/WDMA I.S.1-A-04 - Architectural Wood Flush Doors.
  - 3. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), Second Edition, 2014.
  - 4. National Fire Protection Association - NFPA 80 - Standard for Fire Doors and Other Opening Protectives, 2010 Edition.
- B. Guide References and Standard Practices: Follow recommendations of the following.
  - 1. WDMA - How To Store, Handle, Finish, Install and Maintain Wood Doors.

##### 1.03 COORDINATION

- A. Templates: Hardware templates for hardware mounted on wood doors will be submitted under Section 08 71 00 directly to wood door manufacturer immediately after acceptance of hardware schedule. Report failure to receive templates with reasonable promptness to General Contractor.

##### 1.04 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Shop Drawings: Indicate location, size, elevation, details of construction, hardware blocking, fire rating, factory preparation requirements for each door type.
- C. Samples:
  - 1. Finish Samples: Submit finish samples on specified veneer for factory finished doors for acceptance.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Manufacturer's Instructions:
  - 1. Preparation Instructions: Submit to the Architect with shop drawings two (2) copies of door manufacturer's written instructions for preparation for finishing.

## 1.06 CLOSEOUT SUBMITTALS

- A. Procedures: Submit the following in accordance with Section 01 78 00.
  - 1. Warranty.

## 1.07 QUALITY ASSURANCE

- A. Regulatory Requirements: Provide UL or Warnock Hersey label on doors indicated on door schedule.
  - 1. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, advise Architect prior to submission of bids.

## 1.08 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
  - 1. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration.
- B. Delivery and Acceptance Requirements:
  - 1. Do not deliver doors to building until it is entirely enclosed, drywall and concrete work is completed and humidity in the building has reached average relative humidity of locality.
  - 2. Factory Finished Doors: Deliver individually wrapped in poly bags.
- C. Storage and Handling Requirements:
  - 1. Comply with recommendations of WDMA document, "How To Store, Handle, Finish, Install and Maintain Wood Doors" and with manufacturer's recommendations.
  - 2. Stack doors flat and off floor.
  - 3. Do not drag doors across one another.

## 1.09 WARRANTY

- A. Interior Door Warranty: Provide written warranty in accordance with Section 01 78 00 for solid core doors for life of installation to include reasonable cost of rehang and refinishing.
  - 1. Warranty: Cover warping (bow, cup or twist); photographing of construction below face veneers; and tolerance limitations of WDMA.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Algoma Hardwoods, Inc.; [www.algomahardwoods.com](http://www.algomahardwoods.com).
  - 2. Eggers Industries; [www.eggertindustries.com](http://www.eggertindustries.com).
  - 3. Graham Wood Doors, an ASSA ABLOY group company; [www.grahamdoors.com](http://www.grahamdoors.com).
  - 4. Marshfield DoorSystems Inc.; [www.marshfielddoors.com](http://www.marshfielddoors.com).

5. Oshkosh Architectural Door Company; [www.oshkoshdoor.com](http://www.oshkoshdoor.com).
6. VT Industries, Inc.; [www.vtindustries.com](http://www.vtindustries.com).

- B. Substitution Requests: Required for all manufacturers not named as Acceptable Manufacturer.
1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  2. During Construction Phase: Submit in accordance with Section 01 25 00.

## 2.02 FLUSH DOORS

- A. Interior Solid Core Flush Doors:
1. Thickness: 1-3/4 inches unless otherwise indicated.
  2. Faces: Match existing.
  3. AWI Quality Grade: Custom.
  4. Finish: Factory finished. See Article 2.04.
  5. Under Cutting: Preserve full bottom rail.
  6. Solid Core Door AWI Construction Type: PC-5 or PC-7 particleboard core.
  7. Fire Rated Door AWI Construction Type: As indicated.
    - a. Fire Rated Mineral Core Doors: Provide lock blocks. Provide panic blocks for panic hardware.
    - b. Provide factory prefitting and premachining as required for fire rated labels.

## 2.03 GLASS STOPS

- A. Fire Rated Wood Glass Stops: Algoma or Doranson Systems, Inc. 20 minute rated glass tops. Metal clips with wood trim to match door veneer.
- B. Non-Fire Rated Wood Glass Stops: Match door veneer.

## 2.04 FACTORY PREFITTING AND PREMACHINING

- A. Doors: Prefit and premachine doors at factory.
1. Take accurate field measurements of hardware mortised in metal frames to verify dimensions and alignment before proceeding with machining in factory.
  2. Machine doors for hardware requiring cutting of doors.
  3. Comply with accepted hardware schedules and doorframe shop drawings with hardware templates to ensure proper fit of doors and hardware.
- B. Tolerances: Comply with WDMA tolerance requirements for prefitting.

## 2.05 FACTORY FINISHING

- A. Wood Door Finish System: AWI Custom Grade, complying with AWI Finish System 11, Polyurethane, Catalyzed.
- B. Color: Match existing.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verification of Conditions: Comply with Section 01 71 16:
1. Before installation, verify that frames are proper size and type for door and are installed as required for proper installation of doors.

- B. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.
- C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### 3.02 PREPARATION

- A. Conditioning: Condition doors to average humidity in installation area prior to hanging.
- B. Prefitting: Prefit doors to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.
- C. Sealing: Before installation of hardware, brush apply exterior seal coat to all job site cut or planed surfaces.
  - 1. Sealer: Type recommended by manufacturer.

### 3.03 INSTALLATION

- A. General: Install doors in accordance with manufacturer's recommendations.
  - 1. Fit to width by planing and fit to height. In no case shall doors be cut down to opening sizes smaller than those for which they were manufactured.
  - 2. Installation: By skilled finish carpenters or factory authorized installers.
  - 3. Installer: Thoroughly familiar with the requirements of the manufacturer's door warranty as currently in effect and assure compliance with all provisions.
- B. Clearance:
  - 1. Non-Fire Rated Doors:
    - a. Jamb: 1/8-inch, 1/8-inch bevel in 2 inches.
    - b. Head: 1/8-inch.
    - c. Between Double Doors: 1/8-inch.
    - d. Bottom at Decorative Floor Finish or Covering: 1/2-inch.
    - e. Bottom at Threshold: 1/4-inch between bottom of door and top of threshold.
  - 2. Fire Rated Doors: Comply with applicable building code.
- C. Hanging:
  - 1. After sizing doors, fit for hardware as scheduled. Before installation of hardware, brush-apply an exterior seal coat to job site cut surfaces. Use sealer recommended by door manufacturer.
  - 2. Hang doors to be free of binding with hardware functioning properly.
- D. Glazing Stops: Temporarily factory installed. Permanent installation in field.

### 3.04 ADJUSTING

- A. At completion of job, adjust doors and hardware as required and leave in proper operating condition.
- B. Replacement: Refinish or replace doors damaged during installation.
  - 1. Causes for Rejection: Include chips, scratches or gouges of veneer.

### 3.05 PROTECTION

- A. Protect installed wood doors from damages or deterioration until Substantial Completion. Follow methods recommended by door manufacturer and WDMA recommendations.



- B. Cover wood doors after hanging with appropriate materials to prevent incidental damage to door surfaces and finish during subsequent construction operations.

END OF SECTION



## SECTION 08 31 00

### ACCESS DOORS AND PANELS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Access doors into pipe and utility spaces.
- B. Related Requirements:
  - 1. Furnishing Access Doors as Specified in This Section for Plumbing Equipment: Division 22 Plumbing.
  - 2. Furnishing Access Doors as Specified in This Section for Mechanical Equipment: Division 23 Heating, Ventilating, and Air Conditioning (HVAC).
  - 3. Furnishing Access Doors as Specified in This Section for Electrical Equipment: Division 26 Electrical.
  - 4. Openings for Access Doors and Finishing After Installation: Applicable sections.

##### 1.02 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Manufacturer's current product data sheets describing products to be supplied with all selected options clearly identified, basic uses, components, materials, physical properties, precautions and limitations, applicable standards, approvals, and general installation procedures.
- C. Shop Drawings: Submit layout plan.

##### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery and Acceptance Requirements:
  - 1. Deliver materials in original packages bearing brand name and identification of manufacturer.
- B. Storage and Handling Requirements:
  - 1. Store doors, frames and panels under cover and in manner to prevent twisting.
  - 2. Doors and panels with dimples or dents will be rejected.

#### PART 2 PRODUCTS

##### 2.01 FLUSH-MOUNTED, NON-RATED ACCESS DOORS

- A. Acceptable Manufacturers and Products – Flush-Mounted, Non-Rated Access Doors for Installation in Plaster Walls and Ceilings:
  - 1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model PS-5030.
  - 2. J,L. Industries; [www.jlindustries.com](http://www.jlindustries.com) - Model PW.
  - 3. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) - Model DSC-214 PL.
  - 4. Milcor; [www.milcorinc.com](http://www.milcorinc.com) -Style K.
  - 5. Nystrom Building Products; [www.nystrom.com](http://www.nystrom.com) - Model NP.

6. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) - WB-PL.
  7. Substitution Requests: In accordance with Section 01 25 00.
- B. Acceptable Manufacturers and Products - Flush-Mounted, Non-Rated Access Doors for Installation in Masonry, Tile, Concrete, or Gypsum Drywall:
1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model UF-5000.
  2. J.L. Industries; [www.jlindustries.com](http://www.jlindustries.com) - Model TM.
  3. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) - Model DSC-214M.
  4. Milcor; [www.milcorinc.com](http://www.milcorinc.com) - Style M.
  5. Nystrom Building Products; [www.nystrom.com](http://www.nystrom.com) - Model NT.
  6. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) – WB Series.
  7. Substitution Requests: In accordance with Section 01 25 00.
- C. Acceptable Manufacturers and Products - Flush-Mounted, Non-Rated Ceiling Panels Located in Non-Rated Drywall Ceilings:
1. Karp Associates, Inc. ; [www.karpinc.com](http://www.karpinc.com) – Model KDW.
  2. Substitution Requests: In accordance with Section 01 25 00.
- D. Sizes: As indicated on Drawings or as required to properly service mechanical or electrical equipment.
- E. Material: Stainless steel.
- F. Finish:
1. Stainless Steel: No. 4 satin finish.
- G. Locking Devices: Screwdriver operated cam latch.

## 2.02 RECESSED ACCESS DOORS

- A. Acceptable Manufacturers and Products – Recessed, Non-Rated Access Doors for Installation in Plaster Walls and Ceilings:
1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model AP-5010.
  2. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) - Model DSC-210 PL.
  3. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) - WB-AP.
  4. Substitution Requests: In accordance with Section 01 25 00.
- B. Acceptable Manufacturers and Products - Non-Rated Access Doors, Recessed for Cladding with Gypsum Drywall Panel, for Installation in Non-Rated Gypsum Board Walls and Ceilings:
1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model DW-5015.
  2. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) - Model RDW.
  3. Nystrom Building Products; [www.nystrom.com](http://www.nystrom.com) - Model RW.
  4. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) - WB-RDW.
  5. Substitution Requests: In accordance with Section 01 25 00.
- C. Acceptable Manufacturers and Products - Non-Rated Access Doors, Recessed for Installation of Acoustical Ceiling Tile:
1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model AT-5020.
  2. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) - Model DSC-210.
  3. Milcor; [www.milcorinc.com](http://www.milcorinc.com) - Style CT.
  4. Nystrom Building Products; [www.nystrom.com](http://www.nystrom.com) - Model RA.
  5. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) - WB-AT.
  6. Substitution Requests: In accordance with Section 01 25 00.

- D. Acceptable Manufacturers and Products –Fire-Resistive Access Doors, Recessed for Cladding with Double Layer Gypsum Drywall Panel, for Installation in Fire-Rated Gypsum Board Floor/Ceiling Assemblies:
  - 1. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) – Model KATR.
  - 2. Substitution Requests: In accordance with Section 01 25 00.
- E. Sizes: As indicated on Drawings or as required to properly service mechanical or electrical equipment.
- F. Material: Stainless steel.
- G. Finish:
  - 1. Stainless Steel: No. 4 satin finish.
- H. Locking Devices: Key operated cam locks.

### 2.03 FIRE-RATED ACCESS DOORS

- A. Acceptable Manufacturers and Products – Flush-Mounted Fire-Rated Access Doors:
  - 1. Acudor Products, Inc.; [www.acudor.com](http://www.acudor.com) - Model FB-5050.
  - 2. Karp Associates, Inc.; [www.karpinc.com](http://www.karpinc.com) – Model KRP-150 FR.
  - 3. J.L. Industries; [www.jlindustries.com](http://www.jlindustries.com)- Model FD.
  - 4. Milcor; [www.milcorinc.com](http://www.milcorinc.com) – Style UFR.
  - 5. Nystrom Building Products; [www.nystrom.com](http://www.nystrom.com) – Model IT.
  - 6. Williams Brothers Corporation of America; [www.wbdoors.com](http://www.wbdoors.com) – Model WB-FR.
  - 7. Substitution Requests: In accordance with Section 01 25 00.
- B. Fire Rating:
  - 1. Provide fire rating label acceptable to local building code authority on access doors to be installed in fire rated walls and ceilings.
  - 2. Walls: 1-1/2 hour UL “B” label.
  - 3. Ceilings: Approved by Warnock Hersey International for 3 hours.
- C. Sizes: As indicated on Drawings or as required to properly service mechanical or electrical equipment, but not larger than limit for required fire rating.
- D. Material: Stainless steel.
- E. Finish:
  - 1. Stainless Steel: No. 4 satin finish.
- F. Locking Devices: Key operated cam locks.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Access Doors:
  - 1. Mechanical or Electrical Access: Access doors required for access to mechanical or electrical equipment shall be provided under Division 22, Division 23, or Division 26 and installed by the trade responsible for the material in which door is located.
  - 2. General Access: Furnish access door indicated on Drawings for general access to be installed by trade responsible for material in which door is located.

3. Type:
  - a. Installation in Non-Rated Walls and Ceilings:
    - 1) In Janitor Rooms, Mechanical and Electrical Rooms, and Other Rooms Generally Accessible to Staff Personnel Only: Flush-mounted, non-rated.
    - 2) Areas and Rooms Accessible to Public: Recessed type, unless flush-mounted is specifically approved by Architect.
  - b. Installation in Fire-Rated Walls and Ceilings: Fire-rated type.
    - 1) Fire Rated Floor/Ceiling Assemblies: Fire-resistive access door with double layer of gypsum board acceptable provided finished door retains fire rating of floor/ceiling assembly.

END OF SECTION

## SECTION 08 71 00

### DOOR HARDWARE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:
  - a. Swinging doors.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.

##### 1.2 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

## 1.3 SUBMITTALS

### A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.

### B. Action Submittals:

1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
3. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
  - a. Door Index; include door number, heading number, and Architects hardware set number.
  - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
  - c. Type, style, function, size, and finish of each hardware item.
  - d. Name and manufacturer of each item.
  - e. Fastenings and other pertinent information.
  - f. Location of each hardware set cross-referenced to indications on Drawings.
  - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
  - h. Mounting locations for hardware.
  - i. Door and frame sizes and materials.
  - j. Name and phone number for local manufacturer's representative for each product.
  - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
    - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
4. Key Schedule:
  - a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.



- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
    - 1) Forward bitting list, key cuts and key system schematic directly to Tri-City Medical Center, by means as directed by Tri-City Medical Center.
  - f. Prepare key schedule by or under supervision of supplier, detailing Tri-City Medical Center's final keying instructions for locks.
5. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.
- C. Informational Submittals:
- 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
  - 2. Product Certificates for electrified door hardware, signed by manufacturer:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  - 3. Certificates of Compliance:
    - a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
    - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
    - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
  - 4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
  - 5. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
    - e. Final approved hardware schedule, edited to reflect conditions as-installed.
    - f. Final keying schedule
    - g. Copies of floor plans with keying nomenclature
    - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

## 1.4 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
  - 1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
    - a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.
  - 2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Tri-City Medical Center, Architect, and Contractor, at reasonable times during the Work for consultation.
  - 1. Warehousing Facilities: In Project's vicinity.
  - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
  - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
  - 4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
    - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
  - 2. Can provide installation and technical data to Architect and other related subcontractors.
  - 3. Can inspect and verify components are in working order upon completion of installation.
  - 4. Capable of producing wiring diagrams.
  - 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
  - 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
  - 2. Maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
  - 4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
  - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
  - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
  - 2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
  2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
  3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Tri-City Medical Center.
- F. Deliver keys and permanent cores to Tri-City Medical Center by registered mail, overnight package service or as directed by Tri-City Medical Center.

## 1.6 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Tri-City Medical Center's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Direct shipments not permitted, unless approved by Contractor.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
    - a. Closers:
      - 1) Mechanical: 30 years.
    - b. Locksets:
      - 1) Mechanical: 3 years.
    - c. Key Blanks: Lifetime
  2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. The Tri-City Medical Center requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

### 2.2 MATERIALS

- A. Fasteners
  - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
  - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  - 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
  - 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

### 2.3 HINGES

- A. Provide three-knuckle, concealed bearing hinges.

1. Manufacturers and Products:
  - a. Scheduled Manufacturer and Product: Ives 3CB series
  - b. Acceptable Manufacturers and Products: Hager AB series, McKinney TA series

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
3. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

## 2.4 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.5 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Corbin-Russwin ML2000 series
2. Acceptable Manufacturers and Products: No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: LWA

## 2.6 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Corbin-Russwin
2. Acceptable Manufacturers: No Substitute

B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. Conventional cylinder with permanent core with 77 keyway.

## 2.7 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:
  - 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - a. Keying system as directed by the Tri-City Medical Center.
  - 2. Provide keys with the following features.
    - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
  - 3. Identification:
    - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
    - b. Identification stamping provisions must be approved by the Architect and Tri-City Medical Center.
    - c. Stamp cylinders/cores and keys with Tri-City Medical Center's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    - d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Tri-City Medical Center.
    - e. Forward permanent cylinders/cores to Tri-City Medical Center, separately from keys, by means as directed by Tri-City Medical Center.
  - 4. Quantity: Furnish in the following quantities.
    - a. Change (Day) Keys: 3 per cylinder/core.
    - b. Permanent Control Keys: 3.
    - c. Master Keys: 6.
    - d. Unused balance of key blanks shall be furnished to Tri-City Medical Center with the cut keys.

## 2.8 DOOR CLOSERS

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: LCN 4040XP series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
  - 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.



3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.9 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

### B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

## 2.10 DOOR TRIM

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

### B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.

3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

## 2.11 PROTECTION PLATES

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

### B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
  - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

## 2.12 DOOR STOPS AND HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

### B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

## 2.13 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer: Pemko

### B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
  - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
  - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

## 2.14 FINSHES

- A. Finish: BHMA 626/652 (US26D); except:
  1. Hinges at Exterior Doors: BHMA 630 (US32D)
  2. Continuous Hinges: BHMA 630 (US32D)
  3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
  4. Protection Plates: BHMA 630 (US32D)
  5. Overhead Stops and Holders: BHMA 630 (US32D)
  6. Door Closers: Powder Coat to Match
  7. Wall Stops: BHMA 630 (US32D)
  8. Latch Protectors: BHMA 630 (US32D)
  9. Weatherstripping: Clear Anodized Aluminum
  10. Thresholds: Mill Finish Aluminum

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  2. Custom Steel Doors and Frames: HMMA 831.
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce 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 according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
- I. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- J. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- K. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- L. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

### 3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.

- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.5 DEMONSTRATION

- A. Provide training for Tri-City Medical Center's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

### 3.6 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

- B. Hardware Sets:

#### Hardware Group 01 - Staff Lounge

Door(s):  
001

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	ML2010 LWA	630	C-R
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CVX [REQUIRES WALL BACKING]	630	IVE
1	EA	SEAL	S88BL	BLK	PEM

#### Hardware Group 02 - Staff Lounge (FR)

Door(s):  
002

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	ML2010 LWA	630	C-R
1	EA	SURFACE CLOSER	4040XP MC	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CVX [REQUIRES WALL BACKING]	630	IVE
1	EA	SEAL	S88BL	BLK	PEM
1	EA	THRESHOLD	272A	AL	PEM

The threshold is required for the fire rating; however, if the flooring/sill is non-combustible, the threshold is not required.

Hardware Group 03 - C.U. Room

Door(s):  
003

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 5 X 4.5	630	IVE
1	EA	DOOR PULL, 1" ROUND	8103EZHD 12" STD	630AM	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630AM	IVE
1	EA	SURFACE CLOSER	4040XP H MC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CVX [REQUIRES WALL BACKING]	630	IVE
1	EA	SEAL	S88BL	BLK	PEM

Hardware Group 04 - Ante and Isolation Rooms

Door(s): 004 005

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 5 X 4.5	630	IVE
1	EA	DOOR PULL, 1" ROUND	8103EZHD 12" STD	630AM	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630AM	IVE
1	EA	SURFACE CLOSER	4040XP H MC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CVX [REQUIRES WALL BACKING]	630	IVE
1	EA	SEAL	S88BL	BLK	PEM
1	EA	GASKETING	297AS	AL	PEM
1	EA	DOOR BOTTOM	434ARL	AL	PEM

Hardware Group 05 - Utility Closet

Door(s): 007 008

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	STOREROOM LOCK	ML2057 LWA	630	C-R
1	EA	MASTER RING CYLINDER	1060 118 77 KWY	626	
2	EA	OH STOP & HOLDER	450F	630	GLY
1	EA	SEAL	S88BL	BLK	PEM
1	EA	ASTRAGAL	355CS	AL	PEM

Hardware Group 06 – 1 - Bed

Door(s): 006

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 5 X 4.5	630	IVE
1	EA	DOOR PULL, 1" ROUND	8103EZHD 12" STD	630AM	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630AM	IVE
1	EA	SURFACE CLOSER	4040XP H MC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CVX [REQUIRES WALL BACKING]	630	IVE
1	EA	SEAL	S88BL	BLK	PEM

End of Section





## SECTION 08 80 00

### GLAZING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Glass and Glazing For:
    - a. Hollow Metal Frames: Section 08 12 13.
    - b. Wood Doors: Section 08 14 00.
  - 2. Glazing sealants.
- B. Related Requirements:
  - 1. Framed Mirrors: Section 10 28 13 Toilet Accessories.

##### 1.02 REFERENCES

- A. Reference Standards - See Section 01 42 00. Comply with:
  - 1. ANSI Z97.1-2009 – Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; [www.ansiz97.com](http://www.ansiz97.com).
  - 2. Glazing Association of North America (GANA); [www.glasswebsite.com](http://www.glasswebsite.com):
    - a. GANA Glazing Manual, 50<sup>th</sup> Anniversary Edition.
    - b. GANA Tempering Division Engineering Standards Manual, 2008 edition.
- B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified.
  - 1. Glazing Association of North America (GANA); [www.glasswebsite.com](http://www.glasswebsite.com):
    - a. GANA Sealant Manual, 2008 edition.
    - b. GANA Laminated Glazing Reference Manual, 2009 edition.
  - 2. Insulating Glass Manufacturers Alliance - IGMA Technical Publication TM-3000-90 (04) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit for all glass products and accessories supplied under this Section.
- C. Samples: Submit samples of each type of glass and mirror.
  - 1. Cut sizes as requested by Architect.

##### 1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Fire-Rated Glass: UL approved.
  - 2. Safety Glass and Glazing: Comply with State Statutes, IBC and ANSI Z97.1.
- B. Labels: Each Individual Piece of Glass: Bear label designating type, thickness and quality. Do not remove labels until reviewed by Architect.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery and Acceptance Requirements: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- C. Storage and Handling Requirements:
  - 1. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
  - 2. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Float Glass Manufacturers:
  - 1. AGC Flat Glass North America; [www.na.agc-flatglass.com](http://www.na.agc-flatglass.com).
  - 2. Cardinal Glass Industries; [www.cardinalcorp.com](http://www.cardinalcorp.com).
  - 3. Guardian Industries Corporation; [www.guardian.com](http://www.guardian.com).
  - 4. Pilkington North America Inc.; [www.pilkington.com](http://www.pilkington.com).
  - 5. PPG Industries Corporation; [www.ppg.com](http://www.ppg.com).
- B. Acceptable Manufacturers – Heat Strengthened and Fully Tempered Safety Glass:
  - 1. American Glass Products (AGP) Company.
  - 2. Guardian Industries Corporation; [www.guardian.com](http://www.guardian.com).
  - 3. Interpane Glass Company.
  - 4. Oldcastle BuildingEnvelope; [www.oldcastlebe.com](http://www.oldcastlebe.com).
  - 5. Pilkington North America Inc.; [www.pilkington.com](http://www.pilkington.com).
  - 6. PPG Industries Corporation; [www.ppg.com](http://www.ppg.com).
  - 7. Viracon; [www.viracon.com](http://www.viracon.com).
- C. Acceptable Manufacturers – Wired Glass:
  - 1. Anemostat Products; [www.anemostat.com](http://www.anemostat.com).
  - 2. General Glass Corporation.
  - 3. Pilkington North America Inc.; [www.pilkington.com](http://www.pilkington.com).
- D. Acceptable Manufacturers and Products - Preshimmed Glazing Tape:
  - 1. Bostik - Chem-Tape 60.
  - 2. Pecora - Shim-Seal Tape.
  - 3. Tremco - Preshimmed 440 Tape.
- E. Acceptable Manufacturers and Products - Silicone Glazing Compound:
  - 1. General Electric - Silglaze N.
- F. Substitution Requests: In accordance with Section 01 25 00.

### 2.02 PERFORMANCE

- A. Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation;

failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

### 2.03 GLASS

- A. General: Glass shall be annealed, heat strengthened or tempered as specified and as required by codes or as required to meet thermal stress and wind loads.
- B. Annealed Float Glass: ASTM C1036-06, Type 1, Class 1, clear, Quality q3.
- C. Fully Tempered Glass: ASTM C1048-04, Type 1, Class 1, clear, Quality q3, Kind FT.
- D. Wired Glass: ASTM C1036-06 Type II (patterned and wired flat glass), Class 1 (clear), Quality-q6; UL approved, with vertical and horizontal wire only.
  - 1. Fire and Safety Rated Glazing: 1/4-inch thick polished wire glass with surface applied safety film on one side, complying with IBC requirements..
    - a. Clear with 3/4-inch by 3/4-inch diamond wire pattern.
    - b. Fire Rating: UL listed for interior doors, sidelites, transoms, and borrowed lites, and carrying classification markings meeting scheduled door fire rating up to 90 minutes, D-NT-H, Door, Not Temperature Rise, Hose Stream Tested.
    - c. Impact/Safety Rating: ANSI Z97.1, Category II.

### 2.04 GLAZING SCHEDULE

<u>Type</u>	<u>Description</u>
TSG-1	Safety Rated Single Pane: 1/4 inch tempered safety glass, clear.
WFG-1	Interior Glazing –Fire Rated: 1/4 inch thickness clear, UL approved, wired glass..

### 2.05 ACCESSORIES

- A. Setting Blocks, Shims and Glazing Clips: Size and type as recommended by glass manufacturer.
- B. Preshimmed Glazing Tape: Preformed, adhesive, elastomeric butyl/polyisobutylene glazing tape with continuous built-in EPDM shim, designed for pressure sealing of glazing units in framing system.
  - 1. Sealant Compatibility: Provide tape compatible with silicone glazing sealant.
  - 2. Tape for Fire Rated Glazing: GT-18, 1/8-inch fire rated glazing tape.
- C. Cleaners, Primers and Sealers: Type recommended by sealant gasket manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Comply with Section 01 71 16:
  - 1. Layout: Verify layout of work before beginning installation.
  - 2. Existing Conditions:
    - a. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

- b. Before glazing, verify that frames are plumb and square with metals stops set for proper glass-to-stop face clearance.
- 3. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.

B. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### 3.02 PREPARATION

- A. Protection: Completely cover glass during spray painting, texturing or other construction operations that might cause damage to glass.

### 3.03 GLAZING

#### A. Stops:

- 1. Hold glass with wood or metal stops as detailed.
  - a. Stops: Furnished under other sections.
- 2. Carefully remove any stop already in place as necessary to permit glazing.
- 3. Handle stops carefully and install to avoid damage.

#### B. Glazing in Wood or Metal Frames:

- 1. Tape entire opening to prevent glass from touching frame in any direction.
- 2. Center glass in glazing rabbet to maintain recommended clearances at all four, inside and out.
- 3. Rest glass on setting blocks as recommended by the glass manufacturer.
- 4. Install shims or use shim tape as recommended to maintain clearance between stops and face of glass.
- 5. Install glazing tape and stop in with specified stops.
  - a. Fire Rated Glazing: Apply tape to both sides of glass.
- 6. Cover top of tape with silicone sealant on both sides of frame.
- 7. Cut all glass with smooth, straight edges of full size required by the openings. Edge clearances shall comply with GANA standards.
- 8. Leave sealant smooth and clean. Remove sealant from adjoining surfaces without damaging the finish.

#### C. Glazing Tolerances: Maintain glazing tolerances between glass and frame or stops as recommended by GANA.

- 1. 1/4 Inch Thickness Glass: Maintain 1/8 inch clearance between glass face and metal stops.

### 3.04 ADJUSTMENTS

- A. Upon completion, installation shall be free of scratches and rattles.
- B. Breakage: Unless responsibility can be assessed to another contractor, be responsible for glass broken during shipment, storage and installation.

### 3.05 CLEANING

- A. Leave glass in job clean condition with glazing compound and putty carefully removed from glass and adjoining surfaces.
- B. Final Cleaning of Glass: Under Section 01 74 00 Cleaning and Waste Management.

END OF SECTION

## DIVISION 09 – FINISHES

### SECTION 09 05 61

#### COMMON WORK RESULTS FOR FLOORING PREPARATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

###### A. Work Results:

1. Preparation of concrete slabs to receive finish flooring under flooring sections of Division 09, and testing procedures to verify conditions of concrete subfloor are suitable to receive finish flooring.
  - a. Types of Concrete Slabs Included, Where They Occur:
    - 1) Existing cast-in-place structural floor slabs to receive new flooring.
  - b. Concrete slabs to receive finish flooring of the following types are included, where they occur:
    - 1) Ceramic, Porcelain, Glass, and Quarry Tile Over Waterproofing or Crack Isolation Membrane; and Natural Stone Tile: Section 09 30 00 Tiling.
    - 2) Resilient Sheet Flooring: Section 09 65 16.
  - c. Concrete slabs to receive the following finishes are excluded, where they occur:
    - 1) Sealed concrete, without other finish.
    - 2) Ceramic, porcelain, glass, and quarry tile installed over cementitious or epoxy-based setting materials directly to concrete.
  - d. Testing Included:
    - 1) Moisture vapor emission.
    - 2) Relative humidity.
    - 3) Alkalinity.
    - 4) Bond testing for all interior floor slabs to receive adhered floor finish materials.
2. Concrete slab leveling.
3. Concrete slab cleaning.
4. Vapor emission control treatment, if required.

###### B. Related Requirements:

1. Quality Control and Testing: Section 01 45 00 Quality Control.
2. Preparation of Subfloors to Receive Ceramic Tile: Section 09 30 00 Tiling.

##### 1.02 PRICE AND PAYMENT PROCEDURES

- A. Unit Price for Vapor Emission Control Treatment: Section 01 22 00 Unit Prices.

##### 1.03 REFERENCES

- A. Reference Standards: Comply with following except as modified by supplementary requirements of this Project Specification.
  1. American National Standards Institute (ANSI) Standards:
    - a. ANSI A108 - American National Standard Specifications for Installation of Ceramic Tile:
      - 1) A108.01 – General Requirements: Subsurfaces and Preparations by Other Trades – 2013 (Revised).
  2. ASTM International Standard Specifications and Test Methods:
    - a. ASTM F1869-11 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

- b. ASTM F2170-11 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
  - 1. ASTM International Standard Practices:
    - a. ASTM F710-11 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
    - b. ASTM F2678-10 – Standard Practice for Preparing Panel Underlayments, Thick Poured Gypsum Concrete Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring.

#### 1.04 SCHEDULING

- A. Comply with other requirements specific to each flooring type as specified in Division 09 finish flooring specification sections, and with each finish flooring manufacturer's written instructions regarding scheduling limitations, coordination with other trades, and conditions necessary before flooring may be installed.

#### 1.05 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit for following products for approval by Architect only if products are required to be utilized based on testing results:
  - 1. Vapor Emission Control Treatment: Include data documenting compliance with product performance requirements specified in this section.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Manufacturer's Installation/Application Instructions: Submit for following products for approval by Architect only if products are required to be utilized based on moisture testing results:
  - 1. Maintain one copy on site until completion of product application.

#### 1.07 CLOSEOUT SUBMITTALS

- A. Procedures: Submit in accordance with Section 01 78 00:
- B. Vapor Emission Control Treatment Warranty: If vapor emission control treatment is required, submit Manufacturer's warranty.

#### 1.08 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Vapor Emission Control Treatment Installer: Vapor Emission Control Treatment Manufacturer employed or certified personnel.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.

- B. Delivery and Acceptance Requirements: Deliver products in original unopened manufacturer's containers with labels intact.
- C. Storage and Handling Requirements: Comply with Manufacturer's printed instructions.

#### 1.10 WARRANTY

- A. Finish Flooring Manufacturers' Warranties: In addition to flooring preparation and testing specified under this Section, comply with additional requirements, if any, specified by finish flooring manufacturers as warranty conditions.
- B. Vapor Emission Treatment Performance and Workmanship Warranty: If vapor emission treatment of floor slabs is required to comply with performance requirements of this section, Manufacturer shall provide, in accordance with Section 01 78 00, an installation workmanship and material performance warranty for a period of ten (10) full years from date of application. In the event of treatment system failure by concrete moisture and alkalinity over slab surfaces, joints or cracks, Manufacturer shall provide materials and installation labor for repair or replacement of damaged flooring system at no charge to the Owner. Warranty shall cover repair or replacement of the flooring system, adhesives, patching compounds, and treatment system.
  - 1. Underwriter Coverage of Manufacturer's Warranty: Provide Owner with a warranty underwritten by a product liability insurance carrier, with a maximum "A" rating from Best or equivalent rating system, in the amount of \$5 million per occurrence, and naming Owner, Architect and General Contractor as co-insured.

### PART 2 PRODUCTS

#### 2.01 REGULATORY REQUIREMENTS

- A. All vapor emission control treatment products shall be certified to be VOC compliant with all applicable federal, state and local regulations.

#### 2.02 VAPOR EMISSION CONTROL TREATMENT SYSTEMS

- A. Acceptable Manufacturers and Systems:
  - 1. Ardex Engineered Cements; [www.ardex.com](http://www.ardex.com). – MC Moisture Control System.
    - a. Primer: Ardex P-MC.
    - b. Sealer: Ardex S-MC.
  - 2. Floor Seal Technology, Inc.; [www.floorseal.com](http://www.floorseal.com) – MES 100 vapor emission control system utilizing all of the following components, unless otherwise recommended by system manufacturer based on Project conditions encountered:
    - a. MES Penetrant water-based modified resinous epoxy.
    - b. MES Coating water-based modified resinous epoxy.
    - c. MES Membrane water-based modified resinous epoxy.
  - 3. Koester American Corporation, 757/425-1206; [www.koesterusa.com](http://www.koesterusa.com). - VAP I 2000 System, utilizing all of the following components, unless otherwise recommended by system manufacturer based on Project conditions encountered:
    - a. VAP I Primer, water-based primer/curing agent containing epoxy resins.
    - b. VAP I 2000, 100 percent solids modified resinous epoxy.
  - 4. Synthetics International, 866/646-0356; [www.syntheticsintl.com](http://www.syntheticsintl.com) - Synthetic30, utilizing the following materials:
    - a. Non-porous primer
    - b. Synthetic30 penetrating waterborne polymer.

5. Substitution Requests: Required for all manufacturers and products not named as Acceptable Manufacturer and System.
  - a. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  - b. During Construction Phase: Submit in accordance with Section 01 25 00.
  
- B. Performance Requirements:
  1. Application of vapor emission treatment system to concrete floor slabs that initially fail to meet vapor emission performance requirements specified in Article 2.02 "Performance" shall reduce vapor emission to within specified limits.
  2. Treatment system shall be certified by independent testing agency to meet the following:
    - a. Water Vapor Transmission Rate: Application shall yield a maximum emission rate of 2.0 lbs/ 24 hours/ 1000 ft<sup>2</sup> when tested in accordance with ASTM E96.
    - b. Alkali Resistance: Insensitive for long term to pH exposures up to 14 when tested in accordance with ASTM D1308.
    - c. Pull-Off Concrete Adhesion: Exceeding 500 psi or reaching concrete cohesive failure when tested in accordance with ASTM D4541.
  
- C. Vapor Emission Control Treatment Materials:
  1. VOC Content: Not greater than 65 g/liter in accordance with EPA Method 24 or SCAQMD 1168.
  
- D. Cementitious Underlayment: Required over treated slab.
  1. Acceptable Manufacturers and Products: Ardex K-15 Self-Leveling Underlayment Concrete or alternate product recommended by treatment system manufacturer and compatible with treatment system materials.
  2. System Unit Price: Material, delivery, and installation cost of cementitious underlayment shall be included in unit price of vapor emission control treatment system reported in accordance with Section 01 22 00.

## 2.03 ALKALINITY NEUTRALIZER

- A. Neutralizer for Treating Concrete Floor Slabs with Measured pH Higher Than That Acceptable to Flooring Manufacturer: Use only materials accepted by flooring manufacturer to treat floors to receive flooring manufacturer's products. Obtain manufacturer's written acceptance of proposed treatments.
  
- B. Available Manufacturers and Products:
  1. Foundation Armor; [www.foundatinarmor.com](http://www.foundatinarmor.com) – Armor PH Balance.
  
- C. Prohibited Materials: Acids that, if applied, are detrimental to cement and strength of concrete and/or to flooring adhesives or flooring materials shall not be used.
  1. Vinegar shall not be used.
  2. Muriatic acid shall not be used.

## PART 3 EXECUTION

### 3.01 TESTING, GENERAL

- A. Contractor's Quality Control: The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers. Contractor shall strictly follow concrete floor slab specifications, and shall take all other reasonable measures



necessary to ensure that moisture is controlled and floor slabs are properly prepared to receive specified finish flooring systems.

1. Inspection or testing by the Owner does not relieve Contractor of his responsibility to perform the Work in accordance with the Contract Documents.
- B. Testing Agency: Vapor emission and alkalinity testing will be conducted by an approved testing agency in accordance with ASTM F710 and Section 01 45 00.
1. Cooperate fully with those making tests.
  2. Test Reports:
    - a. Distribution: Reports of tests shall be distributed by independent testing laboratory in accordance with Section 01 45 00. The General Contractor shall make copies and distribute moisture and bond test reports to each flooring contractor.
    - b. Include testing agency name and primary contact of test performer.
    - c. Include type of testing equipment employed.
    - d. Include floor plan with clearly marked test locations.
    - e. Include written description of test placement quality control practices.
    - f. Vapor Emission Tests:
      - 1). Include estimated building temperature at test location.
      - 2) Include test location, starting date, starting time, beginning weight, stopping date, time and ending weight.
      - 3) Indicate computed pounds of emission, including equations.
    - g. Alkalinity Tests: Indicate measured pH test results.
    - h. Relative Humidity Tests: Report testing results in accordance with ASTM F2170.
- C. Testing by Flooring Contractors: If testing by flooring contractor is required by flooring manufacturer as a condition precedent to providing flooring warranty, such testing shall be performed as required by manufacturer, and shall be in addition to testing by the Owner's agency as specified herein.

### 3.02 SLAB MOISTURE TESTING

- A. General: Before beginning installation of finish flooring materials and floor coatings, concrete floor slabs to receive adhesive-applied floor finish materials, fluid-applied flooring, floor coatings, wood flooring, or that will be in contact with moisture-sensitive equipment or products, shall be tested to measure their moisture vapor emission rate (MVER) and internal relative humidity in order to evaluate the slabs' suitability to receive the proposed flooring installation.
- B. Calcium Chloride Tests: Surfaces of concrete floor slabs shall be tested to measure their moisture vapor emission rate (MVER) using the anhydrous calcium chloride testing procedure in accordance with ASTM F1869.
1. Acceptable Test Results: Vapor emission tests will be considered satisfactory if measured moisture emission does not exceed 3 pounds per 1000 square feet over 24 hours.
    - a. Resilient Flooring: Vapor emission tests will be considered satisfactory if measured moisture emission does not exceed 3 pounds per 1000 square feet over 24 hours.
    - b. Wood Flooring, Fluid-Applied Flooring, and Floor Coatings: Vapor emission tests will be considered satisfactory if measured moisture emission does not exceed 3 pounds per 1000 square feet over 24 hours.
    - c. If flooring manufacturer's warranty stipulates a stricter standard, vapor emission test results will be required to meet manufacturer's standard before that flooring may be installed in the failing area of slab.
    - d. Areas to Receive Finish Flooring Materials Warranted for Vapor Emission Greater Than That Specified: Upon submission of sample warranty documenting flooring manufacturer's higher allowable vapor emission limit, such higher limit may be substituted for specified 3 pound limit, subject to Architect's approval.

2. Slabs failing moisture emission test shall receive additional drying time, or, at Owner's option, may be required to receive vapor emission control treatment as specified herein, until further testing demonstrates slab achieves specified moisture vapor emission rate limit.
  3. If, at any given test location, slab passes calcium chloride test, but fails alkalinity (pH) test, and no reasonable explanation is evident for pH test failure other than slab moisture, calcium chloride test shall be repeated at that location to verify original test was not a false positive.
- C. Relative Humidity Tests: Interiors of concrete floor slabs shall be tested using the in situ relative humidity testing procedure specified by ASTM F2170.
1. Acceptable Test Results: Relative humidity shall be measured at 75 percent or less.
    - a. If flooring manufacturer's warranty stipulates a stricter standard, relative humidity test results will be required to meet manufacturer's standard before that flooring may be installed in the failing area of slab.
    - b. Areas to Receive Finish Flooring Materials Warranted for Relative Humidity Greater Than 75 Percent: Upon submission of sample warranty documenting flooring manufacturer's higher allowable relative humidity limit, such higher limit may be substituted for specified 75 percent limit, subject to Architect's approval.
  2. Slabs failing relative humidity test shall receive additional drying time, or, at Owner's option, may be required to receive vapor emission control treatment as specified herein, until further testing demonstrates slab achieves specified moisture vapor emission rate limit.
- D. Test Scheduling: No later than two weeks prior to scheduled finish flooring installation, perform final moisture testing, both calcium chloride and relative humidity tests. Testing shall be a minimum of 3 tests for the first 1,000 square feet of floor area, and one test for each additional 1,000 square feet. Include moisture tests around room perimeter, at columns and where moisture may be evident.

### 3.03 SLAB ALKALINITY TESTING

- A. General: Before beginning installation of finish flooring materials and floor coatings, concrete floor slabs to receive adhesive-applied floor finish materials, fluid-applied flooring, floor coatings, wood flooring, or that will be in contact with moisture-sensitive equipment or products, shall be tested to measure their surface pH in accordance with ASTM F710.
- B. Testing Methods:
1. pH Paper Method: Use wide range pH paper, its associated pH chart, and distilled or deionized water. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for 60 plus-or-minus 5 seconds, then dip the pH paper into the water. Remove immediately, and compare to chart to determine pH reading.
  2. Other pH testing methods such as pH pencils or pH meters, or both, are available and may be used to measure pH.
- C. Testing Scheduling and Locations: Test at same time, rate and near locations of calcium chloride tests, except as follows.
1. Do not test slabs for pH that have been recently bead blasted or otherwise abraded to remove near surface layer. Allow such slabs to remain exposed to air at least 14 days before testing surface for pH.
- D. Acceptable Test Results: Slab alkalinity will be acceptable if measured pH is less than 9.0.
- E. Slabs failing alkalinity test shall receive additional drying time, or, at Owner's option, may be required to receive vapor emission control treatment or pH neutralization treatment as specified herein until further testing demonstrates slab meets this alkalinity limitation.

### 3.04 BOND TESTING FOR RESILIENT FLOORING

- A. General: After cleaning of slab surfaces, and before beginning application of resilient flooring adhesive, resilient flooring contractor(s) shall test adhesive bonding to slab.
- B. Testing Procedures:
  - 1. Using the flooring material and the proposed adhesives, install 3 foot by 3 foot panels spaced approximately 50 feet apart throughout the subfloor area. Select areas next to walls, columns or other light traffic areas.
  - 2. Tape edges of panels to prevent edge drying of adhesive.
  - 3. After 72 hours, check panels in presence of Architect and General Contractor's Superintendent.
- C. Acceptable Test Results: Test will be considered satisfactory if flooring material is found, in the opinion of the Architect, to be securely bonded such that an unusual amount of force is required to lift it from the subfloor.
- D. Slabs failing bond test shall receive additional treatment as specified herein until further testing demonstrates satisfactory bond. Additional treatment may consist of mechanical or chemical cleaning to remove contaminants or vapor emission control treatment of excessively moist concrete subfloor.

### 3.05 PATCHING AND LEVELING

- A. Verification of Conditions: Examine substrate for unevenness which would prevent execution and quality of flooring as specified. Report unsatisfactory conditions to the General Contractor with copy to Architect.
  - 1. Examine subfloors prior to installation to determine that surfaces are free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
  - 2. Levelness: As required by manufacturer of finish flooring material to be installed. In absence of specific criteria from manufacturer, verify subfloor to be level within 3/16 inches in 10 feet.
    - a. Tolerances for Floors to Receive Ceramic or Stone Tile: Section 09 30 00.
  - 3. Surface Profile: Verify surface to be smooth troweled finish.
- B. Patching: Thoroughly clean concrete floors before applying floor coverings. Remove rough spots and any foreign matter that might be evident through the floor covering. Patch minor rough areas, voids and defects with compatible leveling compound. .
- C. Leveling: Level major uneven concrete floor joints or other irregularities by bush hammering or grinding and filling with latex type underlayment. Leveled areas shall be sanded to provide a surface level plus-or-minus 3/16-inch in 10 feet unless flooring manufacturer stipulates stricter criterion. Leveled areas shall be inspected by the Architect before flooring work may proceed.

### 3.06 VAPOR EMISSION CONTROL TREATMENT

- A. General: Slab areas failing moisture testing shall receive specified vapor emission control treatment. Slab areas still failing test after treatment shall receive further treatment as recommended by vapor emission control treatment manufacturer until further testing demonstrates slab meets specified vapor emission limitation and slab surface is accepted for warrantable installation by finish flooring manufacturer(s).
- B. Protection: Mask and protect walls and equipment before beginning scarification and application.

- C. Surface Preparation: Shot blast concrete surface to expose uncontaminated, absorptive, and sound concrete. Do not acid etch concrete surface. Grind near wall base and clean all joints for treatment application. Broom-sweep and vacuum slab surfaces to remove dust and debris. Do not use clean sweeping agents.
  - 1. Fill all cracks, control joints, construction joints, and surface irregularities with resin and cementitious filling materials in accordance with system manufacturer's recommendations.
  - 2. Fibrous Reinforced Slabs: Burn off or scrape away and vacuum after shot blasting, leaving no fibers on concrete surfaces.
- D. Installation: Manufacturer's personnel or manufacturer-certified applicator shall treat slab surfaces in accordance with manufacturer's standard procedures for system and special instructions for specific test results and slab conditions encountered at this Project.
- E. Finishing: Apply primer and cementitious underlayment over treated slabs, using methods recommended by underlayment and treatment manufacturer.
- F. Vapor Emission Retesting: After application of vapor emission treatment, retest directly over treatment using calcium chloride method.

### 3.07 ALKALINITY NEUTRALIZATION TREATMENT

- A. General:
  - 1. Comply with finish flooring manufacturer's instructions. Treat slab surfaces with high measured pH using methods acceptable to finish flooring manufacturer only, and that will in no way void or compromise finish flooring warranty.
  - 2. Coordinate with MVER testing and relative humidity testing. If high pH is measured in concert with high MVER and/or relative humidity, follow procedures specified for slabs failing moisture testing, including, if required, vapor emission control treatment. Neutralization treatment procedures specified in this Article apply only to slabs with acceptable measured moisture vapor emission and relative humidity, but excessive pH at surface.
- B. Water Rinsing: Initial treatment shall consist of neutralizing the slab by rinsing with clean neutral water, using following procedure.
  - 1. Start with a clean, porous concrete.
  - 2. Spray a small area with clean neutral water, rinsing the slab. If in doubt about the water take a pH paper and test the water.
  - 3. Immediately after the application of the water, thoroughly wet vacuum the area rinsed to remove any excess water.
  - 4. Allow it to dry for 24 hours and retest to verify the slab is neutralized.
  - 5. Test pH of neutralized slab again after 7 days to verify pH has not returned to high levels before proceeding with finish flooring installation.
- C. Acid Washing: If water rinsing fails to neutralize slab surface to acceptable pH level, subject to acceptance of finish flooring manufacturer, neutralize slab surface by washing with mild carbonic acid, using following procedure.
  - 1. Spray mild carbonic acid onto the surface of the concrete.
  - 2. Wet vacuum the excess.
  - 3. Immediately rinse the acid with clean neutral water. Do not allow it to dry on the concrete.
  - 4. Wet vacuum the excess water and allow it to dry 24 hours.
  - 5. Test the surface to be verify the pH is neutralized.
  - 6. Test pH of neutralized slab again after 7 days to verify pH has not returned to high levels before proceeding with finish flooring installation.

### 3.08 CLEANING

- A. Before beginning installation of finish flooring materials and floor coatings, floor slabs shall be cleaned of dirt debris, contaminants and other deleterious materials on slab surfaces.
- B. Curing Compound Membranes and Other Coatings:
  - 1. Remove residual curing compound membrane, paint, oils and similar contaminants using shotblasting or other acceptable mechanical cleaning method, or by specified chemical cleaner and stripper in accordance with manufacturer's instructions.
- C. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring.

### 3.09 PROTECTION

- A. During and after flooring preparation, and until commencement of finish flooring installation, protect subfloor slab surfaces from staining, cracking, chipping, and other damage.
- B. Protect freshly placed slabs from weather damage.
- C. Protect slabs from mortar leakage from placing of slabs above.
- D. Take precautions to protect slabs from exposure to significant excess moisture after end of curing period, during drying period, and until commencement of finish flooring installation.
  - 1. Promptly remove snow and standing water from floor slabs.
  - 2. Do not wash construction tools or materials over floor slabs.
- E. Do not permit construction activities such as pipe cutting which could damage or stain floor slabs.
- F. Do not store materials on floor slabs that could expose concrete to oil contamination.

END OF SECTION



## SECTION 09 22 16

### NON-STRUCTURAL METAL FRAMING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Work Results:
  - 1. Metal stud framing for gypsum board partitions.
  - 2. Deflection channels.
  - 3. Metal ceiling and soffit framing.
- B. Related Requirements:
  - 1. Cold-Formed Framing for Exterior Walls, Structural Metal Stud Framing and Cold-Formed Metal Joist Framing: Section 05 40 00 Cold-Formed Metal Framing.
  - 2. Fireproofing Material for Deflection Channels: Section 07 84 00 Firestopping.
  - 3. Ceiling Suspension Systems: Section 09 22 26 Suspension Systems.
  - 4. Gypsum Board: Section 09 29 00.
  - 5. Acoustic Insulation: Section 09 81 16 Acoustic Blanket Insulation.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. ANSI/AISI Standards:
    - a. AISI S201-07 – North American Standard for Cold-Formed Steel Framing – Product Data, 2007 Edition.
    - b. AISI S200-07 – North American Standard for Cold-Formed Steel Framing – General Provisions, 2007 Edition.
    - c. AISI S212-07 – North American Standard for Cold-Formed Steel Framing – Header Design, 2007 Edition.
    - d. AISI S220-11 – North American Standard for Cold-Formed Steel Framing – Nonstructural Members, 2011 Edition.
  - 2. ASTM International Standards: [www.astm.org](http://www.astm.org).
    - a. ASTM C645-11a – Nonstructural Steel Framing Members.
    - b. ASTM C754-11 – Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - 3. Gypsum Association Standards: [www.gypsum.org](http://www.gypsum.org).
    - a. Fire Rated Construction: GA-600-2015 –Fire Resistance Design Manual.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit product data sheets for all non-structural metal framing components and accessories to be provided.
  - 1. Include tables showing gage, depth and limiting unsupported heights for studs demonstrating that proposed stud systems and gages meet performance requirements specified for all conditions indicated on the Drawings. Highlight applicable lines in tables.

##### 1.04 DELIVERY, STORAGE, AND HANDLING:

- A. General Requirements: Comply with Section 01 60 00.

- B. Storage and Handling Requirements:
  - 1. Store metals above ground on platforms, skids, or other supports. Protect metals from surface contamination and corrosion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Non-Structural Metal Partition Stud Manufacturers:
  - 1. California Expanded Metal Products Company (CEMCO); [www.cemcosteel.com](http://www.cemcosteel.com).
  - 2. ClarkDietrich Building Systems LLC, [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 3. MarinoWARE; [www.marinoware.com](http://www.marinoware.com).
  - 4. Studco Building Systems; [www.studcosystems.com](http://www.studcosystems.com).
- B. Substitution Requests: Required for all manufacturers not named Acceptable Manufacturer.
  - 1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  - 2. During Construction Phase: Submit in accordance with Section 01 25 00.

### **2.02 ASSEMBLIES**

- A. Non-Structural Metal Framing for Fire Rated Assemblies:
  - 1. Where UL design numbers are referenced on Drawings, assemblies shall comply with Underwriters Laboratories Inc. Fire Resistance Directory, Volume 2, latest edition. See Sections 01 42 00 and 01 60 00.
  - 2. Where GA design numbers are referenced on Drawings, assemblies shall comply with GA-600.

### **2.03 NON-LOAD-BEARING METAL PARTITION STUDS AND RUNNERS**

- A. Stud Sizes: 3-5/8-inch depth by 1-1/4-inch width except where otherwise indicated.
- B. Steel Stud Gages: Non-load bearing studs shall have structural properties to comply with the notes on the Drawings for gage, depth and limiting heights.
  - 1. Provide 20 gage studs at both sides of door frames, at all fire rated partitions, at walls supporting tile backer board, and at all partitions supporting wall hung casework, fixtures and equipment.
    - a. Verify gages required for support of wall-hung equipment with equipment manufacturer's recommendations.
- C. Steel Stud Runners: Manufacturer's standard to match studs. Provide long leg runners for slip joint at structure above where indicated.

### **2.04 CEILING AND SOFFIT FRAMING**

- A. Non-Accessible Ceiling and Soffit Framing: 20 gauge studs, sizes as indicated, 16 inches on center unless otherwise indicated on Drawings.
  - 1. Spans Greater Than 8 Feet: Joist framing to comply with Section 05 40 00.
- B. Accessible Ceiling and Soffit Framing: Joist framing to comply with Section 05 40 00.

### **2.05 FINISHES**

- A. Finish for Studs, Runners, Bracing and Accessories: Corrosion resistant galvanized coating conforming to ASTM A653, G40 minimum.



## PART 3 EXECUTION

### 3.01 ERECTION OF NON-LOAD-BEARING METAL STUD PARTITIONS

- A. Reference Standard: Erect steel framing in accordance with ASTM C754.
- B. Layouts: Align partition studs accurately according to partition layout.
- C. Anchoring: Anchor runner channels to concrete slabs with concrete stud nails or power-driven anchors at 24 inches on center. Anchor runner channels to ceiling grid where applicable with stove bolts. Install headers where required to receive runners where studs extend above ceiling system.
- D. Studs: Position studs vertically in runners. Anchor studs located adjacent to openings or partition intersections and corners to runners with USG metal lock fastener or with 1/2-inch Type S pan head screws.
  - 1. Space studs 16 inches on center unless otherwise indicated, and not less than that required by referenced steel framing installation standard.
  - 2. Corners and Intersections: Locate studs no more than two inches from abutting partitions, corners, etc.
  - 3. Openings: Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Locate studs not more than two inches from opening frames. Anchor studs to frame anchor clips by bolt or screw attachment. Install runner track section (for cripple studs) at head and secure to jamb studs. Install headers over openings as recommended by the manufacturer.
    - a. Wood Doors and Hollow Metal Doors: Provide two studs at jambs.
  - 4. Wood Blocking: See Section 06 10 53.
  - 5. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum board stud system abuts other construction.
    - a. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
  - 6. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.
  - 7. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  - 8. Terminate partition framing at suspended ceilings where indicated.
  - 9. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.
  - 10. Position studs vertically with open sides facing in same direction and engaging floor and ceiling runners. Begin and end each arc with a stud and space intermediate studs equally along arcs at stud spacing recommended by gypsum board manufacturer for radii indicated.
  - 11. Attach studs to runners with 3/8-inch long pan head framing screws. On straight lengths at ends of arcs, place studs 6 inches on center with last stud left free standing.
- E. Bracing: Provide diagonal bracing at head of studs that terminate above the ceiling level. Bracing shall consist of metal studs bent to V-shape and extending at 45 degrees from partition head to structure above. Locate bracing 48 inches maximum on center.
- F. Top of Partition Deflection Head Assemblies:
  - 1. Provide long leg runners for slip joint at structure above for partitions where indicated.
  - 2. Fire Rated Partitions:
    - a. Firestopping Installation: Under Section 07 84 00.

### 3.02 MISCELLANEOUS FRAMING AND FURRING

- A. Provide necessary framing, and furring for special framing at recesses; specialty items; wall mounted casework, shelving and equipment; etc. Frame around columns as indicated. Provide necessary framing and suspension for offsets, verticals, recessed and all other gypsum board surfaces not provided under Section 09 22 26.

END OF SECTION

**SECTION 09 22 26**  
**SUSPENSION SYSTEMS**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Work Results:
  - 1. Metal suspension for gypsum board ceilings.
- B. Related Requirements:
  - 1. Cold-Formed Framing for Exterior Walls, Structural Metal Stud Framing and Cold-Formed Metal Joist Framing: Section 05 40 00 Cold-Formed Metal Framing.
  - 2. Ceiling and Soffit Joist Framing: Section 09 22 16 Non-Structural Metal Framing.
  - 3. Suspension Systems for Acoustical Panel Ceilings: Section 09 51 13 Acoustical Panel Ceilings.

1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. ASTM International Standards: [www.astm.org](http://www.astm.org).
    - a. ASTM C754-07 – Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - 2. Gypsum Association Standards: [www.gypsum.org](http://www.gypsum.org).
    - a. Fire Rated Construction: GA-600-2015 –Fire Resistance Design Manual.

1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit product data sheets for ceiling suspension system. Include all assembly components.

1.04 DELIVERY, STORAGE, AND HANDLING:

- A. General Requirements: Comply with Section 01 60 00.
- B. Storage and Handling Requirements:
  - 1. Store metals above ground on platforms, skids, or other supports. Protect metals from surface contamination and corrosion.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers:
  - 1. Armstrong; [www.armstrong.com](http://www.armstrong.com).
  - 2. Chicago Metallic; [www.chicagometallic.com](http://www.chicagometallic.com).
  - 3. United States Gypsum Company (USG); [www.usg.com](http://www.usg.com).

- B. Substitution Requests: Required for all manufacturers not named Acceptable Manufacturer.
  - 1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  - 2. During Construction Phase: Submit in accordance with Section 01 25 00.

## 2.02 ASSEMBLIES

- A. Suspension Systems for Fire Rated Assemblies:
  - 1. Where UL design numbers are referenced on Drawings, assemblies shall comply with Underwriters Laboratories Inc. Fire Resistance Directory. See Sections 01 42 00 and 01 60 00.
  - 2. Where GA design numbers are referenced on Drawings, assemblies shall comply with GA-600.

## 2.03 DESIGN CRITERIA

- A. Seismic Suspension System Bracing: Ceiling suspension system and connections shall be designed and constructed in accordance with requirements of ICC Evaluation Service Report for ceiling suspension systems in Seismic Design Category adopted by local code.

## 2.04 COMPONENTS

- A. Hangers: Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
  - 1. Wire: ASTM A641, minimum No. 9 gage, soft, Class 1 galvanized.
  - 2. Rods and Flats: Mild steel components.
- B. Suspended Framing System: Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635, including main tees, furring cross channels, furring cross tees, and cross tees.
  - 1. Main Runners: Cold rolled, "C" shaped steel channels, 16 gauge minimum.
    - a. Form to required radius at curved ceilings.
  - 2. Cross Furring: Hat shaped steel furring channels, ASTM C645, 7/8 inch high, 25 gauge, galvanized.
  - 3. Finish: Hot dipped galvanized finish, ASTM A653, Type G30 or better.
  - 5. Provide compression posts and other accessories as required to comply with seismic requirements.

## 2.05 ACCESSORIES

- A. Furring Anchorages: 16 gauge galvanized wire ties, manufacturer's standard wire type clips, bolts, nails or screws recommended by furring manufacturer and complying with ASTM C754.
- B. U-shaped channel molding.

## PART 3 EXECUTION

### 3.01 CEILING SUSPENSION INSTALLATION

- A. General: Install suspension system in accordance with ASTM C754 and manufacturer's instructions and as required to comply with seismic requirements..
- B. Hangers: Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to cast in concrete inserts or other anchorage devices or fasteners as indicated. Install wire hangers spaced not over 48 inches on center in direction of 1-1/2-inch

main runner channels and within 6 inches of ends of main runners or interruptions of ceiling continuity. Hang from structure above. Install hangers 24 inches on center at gypsum drywall ceilings supporting wood or metal ceilings or other secondary ceiling systems.

1. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
  2. Attach directly to structural elements only. Do not connect or suspend steel framing from ducts, pipes or conduit. Loop hangers and wire tie directly or provide anchors or inserts.
  3. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.
- C. At light troffers or other openings, reinforce framing with 3/4-inch cold rolled channels wired atop and parallel to main runner channels.
- D. Provide all necessary framing and suspension for offsets, verticals and decorative recesses, etc. Use drywall studs where indicated or required. See Section 09 22 16 for type.
- E. Install 1-1/2 inch main runner channels 24 inches on center. at ceilings supporting wood or metal ceilings or other secondary ceiling systems.
- F. Seismic Braced System:
1. Install compression posts, splay wires and other accessories as required to comply with seismic requirements.
  2. Extend runners to within 6 inches of walls.
  3. Wire tie or clip furring members to main runners and to other structural supports indicated. In fire resistance rated assemblies, wire tie furring members; do not clip.
  4. Do not permit furring or runners to contact masonry or concrete walls.
  5. Provide 1 inch clearance between furring or runners and abutting walls and partitions.
- G. Installation Tolerances:
1. Do not exceed 1/8 inch in 8' 0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
  2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
  3. Shim as required to comply with specified tolerances.

END OF SECTION



## SECTION 09 29 00

### GYPSUM BOARD

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Work Results:
  - 1. Gypsum board applied to metal stud partitions.
  - 2. Gypsum board ceilings.
  - 3. Other gypsum board interior finishing as indicated.
- B. Products Installed But Not Supplied Under This Section:
  - 1. Access Doors and Panels: Section 08 31 00.
- C. Related Requirements:
  - 1. Acoustical Joint Sealants: Section 07 92 00 Joint Sealants.
  - 2. Non-Structural Metal Framing: Section 09 22 16.
  - 3. Suspension Systems: Section 09 22 26.
  - 4. Cementitious Backing Boards: Section 09 28 13.
  - 5. Sound Insulation: Section 09 81 16 Acoustic Blanket Insulation.
  - 6. Painting: Section 09 91 23 Interior Painting.

##### 1.02 REFERENCES

- A. Definitions:
  - 1. Gypsum Board Construction Terminology: Refer to ASTM C11 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.
- B. Reference Standards: Comply with following:
  - 1. ASTM International Standards: [www.astm.org](http://www.astm.org).
    - a. ASTM C840 - Application and Finishing of Gypsum Board.
    - b. ASTM C1396 / C1396M-09a – Gypsum Board.
  - 2. Gypsum Association Standards: [www.gypsum.org](http://www.gypsum.org).
    - a. GA-216-10 – Application and Finishing of Gypsum Panel Products.
    - b. Fire Rated Construction: GA-600-2015 –Fire Resistance Design Manual.
- C. Guide References and Standard Practices: Follow recommendations of the following:
  - 1. Gypsum Association Publications: [www.gypsum.org](http://www.gypsum.org).
    - a. GA-214-10 – Recommended Levels of Gypsum Board Finish.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit product data with all materials and accessories to be provided plainly identified.

##### 1.04 DELIVERY, STORAGE, AND HANDLING:

- A. Delivery and Acceptance Requirements: Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

- B. Storage and Handling Requirements:
  - 1. Storage: Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
  - 2. Handling: Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

## 1.05 AMBIENT CONDITIONS

- A. Comply with ASTM C840 and Manufacturer's recommendations.
- B. During gypsum panel application and finishing, maintain temperatures within building within range of 55 degrees to 70 degrees F.
- C. Provide adequate ventilation to carry off excess moisture.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers and Products:
  - 1. American Gypsum; [www.americangypsum.com](http://www.americangypsum.com).
    - a. Fire Rated: American Gypsum Firebloc Type X.
    - b. Non-Fire Rated: American Gypsum Eagleroc Regular Gypsum Panels.
    - c. Water Resistant: American Gypsum M-Bloc.
  - 2. CertainTeed Corporation; [www.certainteed.com](http://www.certainteed.com) –ProRoc.
  - 3. Georgia-Pacific Gypsum LLC; [www.gp.com](http://www.gp.com) – ToughRock.
  - 4. National Gypsum Company; [www.nationalgypsum.com](http://www.nationalgypsum.com). - Gold Bond.
  - 5. United States Gypsum Company (USG); [www.usg.com](http://www.usg.com) – Sheetrock.
    - a. Fire Rated: USG tapered edge Firecode (Type X).
    - b. Non-Fire Rated: USG tapered edge Regular Gypsum Panels.
    - c. Moisture Resistant (MR): USG W/R tapered edge Gypsum Panels.
- B. Substitution Requests: Required for all manufacturers not named Acceptable Manufacturer.
  - 1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  - 2. During Construction Phase: Submit in accordance with Section 01 25 00.
- C. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

### 2.02 ASSEMBLIES

- A. Fire Rated Assemblies:
  - 1. Gypsum Board Partitions: Partitions listed and labeled for fire protective ratings where indicated.
  - 2. Where UL design numbers are referenced on Drawings, assemblies shall comply with Underwriters Laboratories Inc. Fire Resistance Directory. See Drawings and Sections 01 42 00 and 01 60 00. Products shall be one of those listed in referenced UL assembly.
  - 3. Where GA design numbers are referenced on Drawings, assemblies shall comply with GA-600.
  - 4. All gypsum board ceilings that are part of a rated roof/ceiling assembly shall comply with all requirements of that assembly.
  - 5. Gypsum board ceilings and soffits that are suspended below rated assemblies are unrated.



## 2.03 GYPSUM BOARD AND JOINT FINISHING MATERIALS

- A. All gypsum board and gypsum board finishing materials shall be formaldehyde-free and asbestos-free.
- B. Faceboards: ASTM C1396.
  - 1. Types:
    - a. Fire Rated: Type X. UL label.
    - b. Non-Fire Rated: Regular.
    - c. Moisture Resistant (MR): Manufactured with moisture resistant core encased in water resistant green face paper and grey back paper.
  - 2. Size for Walls: 5/8 inch by 48 inch wide by vertical length to allow for vertical installation without cross joints.
  - 3. Size for Ceilings: 5/8-inch thick unless specifically indicated otherwise 48 inches wide by length to minimize cross joints.
- D. Finishing Materials: Products compatible with gypsum board type to which they will be applied.
  - 1. Joint Finishing Materials: As recommended by gypsum board manufacturer for use with applicable gypsum board product.
    - a. Joint Tape: Cross-fibered reinforced paper or fiberglass mesh as recommended by manufacturer for use with applicable gypsum board product.
    - b. Joint Compound for Use With Paper Tape: All-purpose type specifically formulated and manufactured for use with embedding tape at gypsum board joints and as a finishing compound, and compatible with tape, substrate and fasteners.
    - c. Joint Compound for Use With Fiberglass Tape: Setting type specifically formulated and manufactured for use with fiberglass tape at gypsum board joints, and compatible with tape, substrate and fasteners.
    - d. Topping Compound: Topping type specifically formulated and manufactured for use for smooth joint finishing in second and third coats. Unthinned

## 2.04 ACCESSORIES

- A. Fasteners: ASTM C1002.
  - 1. Fastening to Wood: One-inch Type W gypsum board screws.
  - 2. Fastening to Metal: One-inch Type S gypsum board screws. Use proper type for gage of stud.
- B. Laminating Adhesive: Setting type compound, formaldehyde-free and asbestos-free, and as recommended by gypsum board manufacturer for use with applicable gypsum board product.
- C. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints that comply with ASTM C1047 and requirements indicated below:
  - 1. Acceptable Manufacturers:
    - a. California Expanded Metal Products Company (CEMCO); [www.cemcosteel.com](http://www.cemcosteel.com).
    - b. ClarkDietrich Building Systems LLC, [www.clarkdietrich.com](http://www.clarkdietrich.com).
    - c. Phillips Manufacturing Company; [www.phillipsmfg.com](http://www.phillipsmfg.com).
    - d. United States Gypsum Company (USG); [www.usg.com](http://www.usg.com) - Beadex.
    - e. Accepted substitute.
  - 2. Material: Formed metal, or metal combined with paper:
  - 3. Edge Trim: USG Sheetrock No. 103 Dur-A-Bead, 1-1/4-inch by 1-1/4-inch, unless otherwise indicated.
  - 4. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C1047, with slot opening covered with removable strip.

- D. Sound Isolation Materials:
  - 1. Sound Attenuation Blankets: See Section 09 81 16.
  - 2. Acoustical Sealant: See Section 07 92 00.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION OF GYPSUM BOARD**

- A. Reference Standards: Apply and finish gypsum board in accordance with ASTM C840 and recommendations of GA 216.
- B. Wall Installation: Apply gypsum wallboard panels vertically with abutting ends and edges occurring over studs or furring.
  - 1. Joints on Opposite Sides of Partitions: Shall not occur over same stud.
  - 2. Two Layer Construction: Stagger joints between layers.
  - 3. Locate exposed end-butt joints as far from center of walls as possible, and stagger not less than 24 inches in alternate courses of board.
  - 4. Install wall/partition boards in manner that minimizes the number of end-butt joints or avoids them entirely where possible.
  - 5. Locate either edge or end joints over supports.
  - 6. Steel Stud Partitions: Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
- C. Ceilings: Install to wood or metal ceiling framing, to suspended framing, or directly to structural framing as indicated. Apply gypsum board of maximum practical length with long dimensions at right angles to supports and fasten with drywall screws spaced 12 inches on center in the field of the board and 8 inches on center along abutting edges. All end and edge joints shall occur over supports with end joints staggered. Properly support gypsum board around cutouts and openings.
- D. Fasteners: Apply board to studs, framing or furring with drywall screws spaced 12 inches on center in field of board and eight inches on center staggered along vertical abutting edges.
  - 1. Use Type S-12 screws for attaching to structural studs.
- E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
- F. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- G. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- H. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.
- I. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally.

- J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.
- K. Layers: Install multiple layer gypsum board as indicated.
- L. Water Resistant: Use at toilet rooms, janitor rooms, and elsewhere as indicated.
- M. Corner Bead: Apply as recommended by manufacturer at exposed out corners.
- N. Trim: Apply as recommended by manufacturer, where gypsum board abuts other materials, and as indicated.
- O. Tolerances: Gypsum board surface plane within plus-or-minus 1/8-inch in 10 feet

### 3.03 FINISHING

- A. Joint Finishing: Apply joint treatment at horizontal and vertical joints, corner bead, trim, penetrations and fastener dimples as recommended by manufacturer.
  - 1. Standard: GA Level 4 finish.
  - 2. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
  - 3. Apply joint tape at joints between gypsum boards except at trim accessories.
  - 4. Drywall: Apply joint compounds in 3 coats. Sand smooth between coats and after last coat.
    - a. Embedding and first coat: Setting-type joint compound.
    - b. Fill coat: Setting-type joint compound.
    - c. Finish coat: Ready-mix drying-type all-purpose or topping compound.

END OF SECTION



## SECTION 09 30 00

### TILING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
1. Ceramic floor tiling.
  2. Ceramic wall tiling.
  3. Ceramic tile base.
  4. Ceramic ceiling tiling.
  5. Porcelain tile and trim.
  6. Stone and glass mosaic wall tiling.
  7. Tile mortar and grout.
  8. Crack isolation membrane.
  9. Other tiling accessories.
- B. Related Requirements:
1. Common Work Results for Flooring Preparation: Section 09 05 61.

##### 1.02 REFERENCES

- A. Definitions:
1. Large Format Tile: A tile 15 inches or larger on any side.
- B. Reference Standards: Comply with the following standards:
1. American National Standards Institute (ANSI) - ANSI A108 - American National Standard Specifications for Installation of Ceramic Tile:

ANSI A108.02-2013	General Requirements: Materials, Environmental, and Workmanship
ANSI A108.5-2010	Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex/polymer modified Portland Cement Mortar
ANSI A108.6-2010	Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy.
ANSI A108.10-2010	Installation of Grout in Tilework
ANSI A108.14-2010	Installation of Paper-Faced Glass Mosaic Tile
ANSI A108.15-2010	Alternate Method: Installation of Paper-Faced Glass Mosaic Tile
ANSI A108.16-2010	Installation of Paper-Faced, Back-Mounted, Edge-Mounted, or Clear Film Face-Mounted Glass Mosaic Tile
ANSI A108.17-2010	Installation of Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone
  2. American National Standards Institute (ANSI) Material Specifications / Test Methods: ANSI A118.

ANSI A118.3-2013	Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive
ANSI A118.4-2012	Modified Dry-Set Cement Mortar
ANSI A118.7-2010	High-Performance Cement Grouts for Tile Installation

ANSI A118.12-2008

Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation

ANSI A118.15-2012

Improved Modified Dry-Set Cement Mortar

3. ANSI A137.1-2012 - Ceramic Tile.
4. ANSI A137.2-2013 – Glass Tile.
5. Tile Council of North America, Inc. (TCNA): TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, 2015 Edition.

C. ASTM International Standard Test Methods:

1. ASTM C627-10 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.

D. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.

1. American National Standards Institute (ANSI) Standards:
  - a. ANSI A108 - American National Standard Specifications for Installation of Ceramic Tile:
    - 1) A108.01-2010 – General Requirements: Subsurfaces and Preparations by Other Trades – 2013 (Revised).

### 1.03 ACTION SUBMITTALS

A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.

B. Product Data: Submit manufacturer's current descriptive and technical data for the following:

1. Factory blended setting mortars.
2. Tile grout.
3. Crack isolation membrane.
4. Tile cleaning agents.
5. Other tiling accessories.

C. Shop Drawings: Indicate tile patterns, colors, locations, and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations.
2. Submit jointing layout based on field dimensions of existing conditions.

D. Samples: Submit complete samples of tile and grout to Architect for color and texture selection or verification.

1. Each type and composition of tile and for each color and texture required, at least one full size sample for each tile specified.
2. Trim for Ceramic Tile: Full size pieces.
3. Provide samples keyed according to specifications.

### 1.04 INFORMATIONAL SUBMITTALS

A. Procedures: Submit for information and verification in accordance with Section 01 33 00.

B. Certifications:

1. Submit "Master Grade Certificate" for each type of tile in accordance with requirements of ANSI A137.1.
2. Submit manufacturer's certifications that mortars, adhesives, and grouts are suitable for intended use.

C. Manufacturer's Site Reports: Submit Manufacturer's Representative's quality control report.

#### 1.05 CLOSEOUT SUBMITTALS

- A. Procedures: Submit the following in accordance with Section 01 78 00.
- B. Maintenance Data: Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.
- C. Warranties: Submit in accordance with Section 01 78 00.

#### 1.06 MAINTENANCE MATERIALS SUBMITTALS

- A. Extra Stock Materials: Provide the Owner 3 percent of each size and color of tile and grout used at completion of the Project.
- B. Store in location as directed by Owner.
- C. Ensure materials are boxed and identified by manufacturer, type, and color, with use-by date, when applicable.

#### 1.07 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Flooring subcontractor must have at least five (5) years' experience in the installation of ceramic tile flooring projects.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
  - 1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
  - 2. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.
  - 3. Protect mortar and grout materials against moisture, soiling, or staining.
- B. Delivery and Acceptance Requirements:
  - 1. Delivery: Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
  - 2. Labeling: Comply with ANSI A137.1.
- C. Storage and Handling Requirements:
  - 1. Storage: Store materials in a clean, dry area.
    - a. Store cementitious materials off the ground and under cover.
    - b. Store premixed setting and grouting materials; admixtures, sealers, cleaning agents, and other liquid products; and accessories in original unopened containers.
    - c. Protect liquid and trowelable products, caulks and sealants from freezing.
  - 2. Handling: Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

#### 1.09 AMBIENT CONDITIONS

- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

- B. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of 2 weeks.
- C. Do not install tile set in Portland cement mortar when the ambient temperature is below 50 degrees F. Comply with minimum temperature requirements of bonding and grouting materials manufacturers.
- D. Maintain continuous and uniform building temperatures of not less than 50 degrees F during installation nor more than 100 degrees F.
- E. Ventilate spaces receiving tile in accordance with material manufacturers' instructions.

#### 1.10 WARRANTIES

- A. Crack Isolation Membrane Warranty: Submit manufacturer's standard 10-year warranty against cracking of ceramic and stone tile due to non-structural horizontal movement in substrate or cracks in substrate not greater than 1/8-inch in width.

### PART 2 PRODUCTS

#### 2.01 PRODUCT OPTIONS

- A. Substitution Requests: Required for all manufacturers and products not named as Basis of Design or as Acceptable Manufacturer and Product.
  1. During Bidding/Negotiation Period: Submit in accordance with Document 00 26 00.
  2. During Construction Phase: Submit in accordance with Section 01 25 00.

#### 2.02 GENERAL REQUIREMENTS FOR TILE

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 for types, compositions, and grades of tile indicated.
  1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
  2. Minimum Dynamic Coefficient of Friction (DCOF) for Interior Floor Tile: 0.66 to 0.76 as measured by the DCOF AcuTest method of ANSI A137.1.
- B. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
  1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
  2. Provide tile trim and accessories that match color and finish of adjoining flat tile unless noted otherwise.
- C. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- D. Provide ¾ inch bullnose tile pieces at all outside corners, exposed edges and top of wainscot as detailed on the Drawings.



## 2.03 INTERIOR CERAMIC AND PORCELAIN TILE

- A. Basis of Design Manufacturers and Products – Ceramic and Porcelain Tile and Base: See Finish Legend on Drawings.
  - 1. American Olean Tile Company; [www.aotile.com](http://www.aotile.com).
  - 2. Crossville, Inc.; [www.crossvilleinc.com](http://www.crossvilleinc.com).
- B. Ceramic Wall Tile: Buff body, approximately 5/16-inch thickness, cushion edges with bright glaze or matte glaze finish as selected.
  - 1. Sizes, Manufacturers and Colors: See Finish Legend on Drawings.
- C. Porcelain Floor Tile:
  - 1. Size: 2" x 2".
  - 2. Colors: See Finish Legend on Drawings.
- D. Performance:
  - 1. Ceramic Tile Water Absorption Rate: Less than 0.5 percent, ANSI A137.1,
  - 2. Porcelain Tile Water Absorption Rate: Less than 0.1 percent, ANSI A137.1,
  - 3. Dynamic Coefficient of Friction: See Finish Legend on Drawings.

## 2.04 NATURAL STONE TILE

- A. Basis of Design Manufacturers and Products – Natural Stone Tile: See Finish Legend on Drawings.
  - 1. Dal-Tile Corporation; [www.daltile.com](http://www.daltile.com) - Daltile.

## 2.05 GLASS TILE

- A. Basis of Design Manufacturers and Products – Glass Mosaic Tile: See Finish Legend on Drawings.

## 2.06 TILE SETTING MATERIALS

- A. Acceptable Manufacturers: Unless noted otherwise, tile setting products by the following manufacturers meeting requirements of these specifications, and equivalent to products listed herein or on the Drawings, will be acceptable, subject to product data submittal and approval by the Architect.
  - 1. Bonsal American, Inc. – ProSpec brand; [www.prospec.com](http://www.prospec.com).
  - 2. Bostik, Inc.; [www.bostik-us.com](http://www.bostik-us.com) – Hydroment brand.
  - 3. C-Cure Chemical Co., Inc.; [www.c-cure.com](http://www.c-cure.com).
  - 4. Custom Building Products; [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
  - 5. Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com).
  - 6. MAPEI Corporation; [www.mapei.us](http://www.mapei.us).
  - 7. Mer-Krete Systems, division of ParexLahabra, Inc.; [www.merkrete.com](http://www.merkrete.com).
  - 8. Specialty Construction Brands, Inc. – TEC brand; [www.tecspecialty.com](http://www.tecspecialty.com).
- B. Sand: ASTM C144.
- C. Portland Cement: ASTM C150.
- E. High performance Portland Cement Mortar: ANSI A118.4 or A118.15. Required for all porcelain tile installations and elsewhere as specified.
  - 1. For Thin-Set Installation on Interior Walls and Other Vertical Surfaces:
    - a. C-Cure PermaBond NonSag 903 mixed with C-Cure CureMix 937.
    - b. MAPEI Ultraflex 2.

2. For Thin-Set Installation on Floors Over Structural Framing: Tile Manufacturer's designated flexible-type mortar for above-grade structural floors.
  - a. Acceptable Products: Subject to approval of tile manufacturer and meeting performance requirements.
    - 1) C-Cure M-Flex Strata 914.
    - 2) Custom Megalite Crack Prevention Mortar.
    - 3) Mapei Kerabond/Keralastic system.
  - b. Mix as recommended by manufacturer.
  - c. Performance: Capable of withstanding substrate deflection up to 1/240 of span without loss of bond or cracking.
3. For Glass Tile Applications: Provide mortar product formulated specifically for use with glass tile and recommended by glass tile manufacturer.
  - a. Color When Used Under Translucent Glass Tile: White.

F. Organic Adhesives and Mastics: Not acceptable for setting of tile.

## 2.07 TILE GROUTING MATERIALS

- A. Acceptable Manufacturers: Unless noted otherwise, tile grouting products by the following manufacturers meeting requirements of these specifications, and equivalent to products listed herein or on the Drawings, will be acceptable, subject to product data submittal and approval by the Architect.
  1. Bonsal American, Inc. – ProSpec brand; [www.prospec.com](http://www.prospec.com).
  2. Bostik, Inc.; [www.bostik-us.com](http://www.bostik-us.com) – Hydroment brand.
  3. C-Cure Chemical Co., Inc.; [www.c-cure.com](http://www.c-cure.com).
  4. Custom Building Products; [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
  5. Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com).
  6. MAPEI Corporation; [www.mapei.us](http://www.mapei.us).
  7. Mer-Krete Systems, division of ParexLahabra, Inc.; [www.merkrete.com](http://www.merkrete.com).
  8. Specialty Construction Brands, Inc. – TEC brand; [www.tecspecialty.com](http://www.tecspecialty.com).
- B. Standard Cement Grout: ANSI A118.6.
  1. For Joints of 1/8-inch Width or Greater: Sanded.
  2. For Joints of Less Than 1/8-inch Width: Unsanded.
- C. High Performance Tile Grout: ANSI A118.7. Latex-modified or polymer modified, unsanded.
  1. For Tile on Interior Walls:
    - a. C-Cure M-P Grout.
    - b. MAPEI Keracolor S.
    - c. MAPEI Ultracolor.
  2. Colors: As selected by Architect.
- D. Epoxy Grout: ANSI A118.3.
  1. Acceptable Products:
    - a. Colored Epoxy Grout:
      - 1) C-Cure ColorSet Epoxy 931.
      - 2) Laticrete SpectraLOCK Pro Premium Grout.
      - 3) MAPEI Kerapoxy Epoxy Grout.
    - b. White Epoxy Grout:
      - 1) C-Cure EverWhite Epoxy 932.
  2. Grout for Commercial Kitchen Application: Industrial grade epoxy grout labeled by manufacturer as meeting the performance requirements of both ANSI A118.3 and ANSI A118.5.
  3. Mixes as recommended by manufacturer.

4. Locations: Epoxy grout required at following locations, and elsewhere as indicated, scheduled, or specified.
  - a. Floors.
- E. Grout for Glass Tile Applications: Provide grout product formulated specifically for use with glass tile and recommended by glass tile manufacturer.
  1. Epoxy Grout for Use with Glass Mosaic Tile:
    - a. Bisazza, [www.bisazzausa.com](http://www.bisazzausa.com) - Bisazza Fill or accepted substitute. Colored 2-component epoxy grout for use with glass mosaic tile.
    - b. C-Cure ColorSet Epoxy 931.
    - c. Accepted substitute.
  2. Cement Grout for Use with Glass Tile: Unsanded unless otherwise recommended by glass tile manufacturer.

## 2.08 EXPANSION JOINT SEALANT

- A. Joint Sealant:
  1. Floors: Two component polyurethane sealant, ASTM C920, Type M (self-leveling) for horizontal joints, Type II (nonsag) for vertical joints as specified in Section 07 92 00.
  2. Walls: Silicone to match grout.
  3. Color: Match grout.
  4. Ensure sealant is chemically compatible with tile, mortar, and grout.
  5. Ensure sealant can physically and chemically withstand environmental conditions normally expected at installation areas.
- B. Joint Backing: Closed cell foam polyethylene.
- C. Expansion and Control Joints for Thin-Set Applications: Extruded rigid PVC profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed.
  1. Height: As required to suit application.
  2. Color: As selected by Architect.
  3. Acceptable Products: Subject to compliance with requirements herein, provide one of the following:
    - a. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-BWB
    - b. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-BWS
    - c. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-BWA

## 2.09 CRACK ISOLATION MEMBRANE

- A. Acceptable Manufacturers and Products:
  1. The Noble Company; [www.noblecompany.com](http://www.noblecompany.com). - NobleSeal CIS.
- B. Performance:
  1. Meet Extra Heavy Service performance requirements of ASTM C627.
  2. System Crack Resistance: Exceed High Performance criteria of ANSI A118.12.
  3. Waterproof Sheet: Comply with waterproofing requirements of ANSI A118.10.
- C. Material: Composite sheet membrane consisting of non-plasticized chlorinated polyethylene (CPE) thermoplastic sheet, laminated with fabric on both surfaces.
- D. Nominal Thickness: 30-mils.

- E. Accessories:
  - 1. Bond Coat: One of the following.
    - a. Membrane manufacturer's standard latex-based adhesive.
    - b. Acrylic or polymer-modified, rapid-curing type, thin-set mortar meeting ANSI A118.4 or A118.15, as recommended by membrane manufacturer for this application.

## 2.10 TRANSITION ACCESSORIES

- A. Wheeled Traffic Tile/Resilient Flooring Transition: Johnsonite; [www.johnsonite.com](http://www.johnsonite.com) - CTA-49-K.
- B. Tile/Resilient Flooring Transition: Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) – RENO-V.
  - 1. Description: Ball-and-socket hinged profile with sloped exposed surface, tapered leading edge, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
  - 2. Material and Finish: Satin anodized aluminum.
- C. Perimeter and Corner Joints: Extruded rigid PVC corner 2-piece, profiles joined by a soft CPE corner profile, with integral PVC perforated anchoring legs for setting the corner joint into the setting material; heights and color as indicated.
  - 1. Color: As selected by Architect.
  - 2. Acceptable Products: Subject to compliance with requirements, provide the following:
    - a. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-HK
    - b. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-HKW
    - c. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-EK
    - d. Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) - DILEX-EKE
    - e. Outside Corners: Schlüter Systems, L.P.; [www.schluter.com](http://www.schluter.com) – RONDEC.

## 2.11 MISCELLANEOUS ACCESSORY MATERIALS

- A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- B. Cementitious Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Before proceeding, examine surfaces to receive tile, setting beds or accessories for defects or conditions adversely affecting quality and execution of the installation.
  - 1. Verify floor surface to be dry, structurally sound, and free of wax, curing compound, and other coatings.
  - 2. Verify floors to receive tile are level and flat within specified tolerances.
  - 3. Verify locations of all expansion and control joints in substrate for compliance with Article "Expansion And Control Joint Installation".
- B. Floor Levelness Tolerances: Floor slabs shall be level within following maximum tolerances measured with 10-foot long straightedge, except slope to drains as indicated.
  - 1. Floors to Receive Thin-Set Ceramic, Porcelain or Stone Tile: ANSI A108.01 and as follows.
    - a. Permissible Levelness Variation for Tile With All Edges Shorter Than 15 Inches:
      - 1) With 1/4-Inch Grout Joints and Larger: 1/4-inch in 10 feet.
      - 2) With 3/16-Inch Grout Joints: 3/16-inch in 10 feet.
      - 3) With 1/8-Inch Grout Joints: 1/8-inch in 10 feet.

- b. Permissible Variation for Large Format Tile With At Least One Edge 15 Inches or Longer:
  - 1) 18-Inch Through 24-Inch Tile Edge Sizes With 1/8-Inch Grout Joints: 3/32-inch in 10 feet.
  - 2) 36-Inch and Larger Tile Edge Sizes With 3/16-Inch or 1/8-Inch Grout Joints: 3/32-inch in 10 feet.
  - 3) Other Tile Sizes and Grout Joint Widths: 1/8-inch in 10 feet.
- C. Floor Flatness Tolerances: Floor slabs shall be flat within following maximum tolerances measured by straightedge, except slope to drains as indicated.
  - 1. Floors to Receive Thin-Set Ceramic, Porcelain or Stone Tile: ANSI A108.01 and as follows.
    - a. Permissible Flatness Variation for Tile With All Edges Shorter Than 15 Inches: No more than 1/4-inch in 10 feet with variations of no more than 1/16-inch in any single foot of length when measured from the high points in the surface.
    - b. Permissible Flatness Variation for Large Format Tile With At Least One Edge 15 Inches or Longer: No more than 1/8-inch in 10 feet with variations of no more than 1/16-inch in any 2 feet of length when measured from the high points in the surface.
- D. Report unsatisfactory conditions to the General Contractor in writing with copy to Architect.
- E. Acceptance: Beginning of installation means acceptance of substrates.

### 3.02 PREPARATION

- A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- B. Cleaning and Surface Preparation: Clean substrates. Prepare surfaces in strict accordance with instructions of tile setting material manufacturer and membrane manufacturer, as applicable.
  - 1. Clean concrete base slab to remove dust, dirt and loose material.
    - a. Acid Based Cleaners: Use not permitted.
  - 2. Mechanically scarify concrete substrates if necessary to completely remove curing compounds, form-release compound, paint, efflorescence, loose material, or other substances that would interfere with proper bond of tile or waterproofing materials.
  - 3. Do not seal substrate unless required by manufacturer.
  - 4. Mechanically grind and level substrate or level with self-leveling underlayment as required to meet flatness tolerance of floor tile to be set.
- C. Porcelain Tile: Clean porcelain tile before installation, removing factory-applied protective coating that inhibits bond.
- D. Crack Isolation Membrane: Install in strict accordance with ANSI A108.17 and manufacturer's printed instructions.
  - 1. Protect membrane from pedestrian or vehicular traffic and prolonged exposure to sunlight.
  - 2. Cracks Larger Than 1/8-Inch in Width: Treat as a movement joint in accordance with TCNA EJ-171.
  - 3. Partial Coverage: Where full coverage crack isolation membrane is not specified, extend crack isolation membrane a minimum of the diagonal measurement of the tile on each side of the crack.

### 3.03 TILE INSTALLATION, GENERAL

- A. Install tile materials in accordance with ANSI A137.1, other referenced ANSI and TCNA specifications, and TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation", except for more stringent requirements of manufacturer or these Specifications.
- B. Cut and fit tile tight to protrusions and vertical interruptions and treat with a compatible sealant as specified in Section 07 92 00. Form corners and bases neatly.
- C. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joint watertight, without voids, cracks, excess mortar, or grout.
- D. Prepare surface, fit, set, bond, grout and clean in accordance with applicable requirements of ANSI standards and Tile Council of North America.
- E. Layout:
  - 1. Lay out work to pattern indicated so that full tile or joint is centered on each wall and no tile of less than half width need be used. Do not interrupt pattern through openings. Lay out tile to minimize cutting and to avoid tile less than half size.
  - 2. For heights stated in feet and inches, use courses of full tile to produce nearest attainable heights without cutting tile.
  - 3. No staggered joints will be permitted.
  - 4. Align joints in tile in both directions.
  - 5. Align joints between floor and base tile.
  - 6. File edges of cut tile smooth and even.
  - 7. Cut and fit tile at penetrations through tile. Do not damage visible surfaces. Carefully grind edges of tile abutting built-in items. Fit tile at outlets, piping and other penetrations so that plates, collars, or covers overlap tile.
  - 8. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
  - 9. Accurately form intersections and returns.
- F. Installing Tile 8x8 and Larger:
  - 1. Apply only as much mortar as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
  - 2. Apply mortar with flat edge of notched trowel sized to facilitate proper coverage using scraping motion to key the mortar into surface to be covered. Comb with the notched side of the trowel in one direction only, horizontally and side to side. Maintain 100 percent coverage on back of tile and fully bed all corners.
  - 3. Trowel mortar onto back of each tile or sheet of tiles. Ensure at least 80 percent coverage for interior applications and at least 95 percent coverage for exterior applications.
  - 4. Firmly press tiles into the mortar and move them perpendicularly across the ridges, forward and back approximately 1/8-inch to 1/4-inch, to flatten the ridges and fill in the valleys.
  - 5. Beat or rap tile to ensure proper bond and also to level surface of tile.
  - 6. Align tile to show uniform joints and allow to set until firm.
  - 7. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.
  - 8. Sound tile after setting. Replace hollow sounding tiles.
  - 9. Periodically remove and check a tile to verify 100 percent coverage is being attained.
- G. Grout Joint Sizes:
  - 1. Glazed Wall Tile: 1/8-inch unless indicated otherwise.
  - 2. Mosaic Tile: 1/8-inch unless indicated otherwise.
  - 3. Quarry Tile: 1/4-inch.

4. Porcelain Tile: 1/8-inch unless indicated otherwise.
5. Pressed Floor Tile: 1/4-inch unless indicated otherwise.
6. Ensure joint width is at least 3 times the maximum variance in tile dimension.

### 3.04 INTERIOR FLOOR TILE INSTALLATION

- A. Tile Floors - Thin Set Installation Over Crack Isolation Membrane on Concrete Structural Slabs: Install, grout, clean, protect and cure in conformance with TCNA Handbook Method F115-15A and ANSI A108.5, flexible latex/polymer modified Portland cement mortar designated by the manufacturer for this application over structural floors, and epoxy grout, with addition of crack isolation membrane in conformance with TCNA Handbook Method F125-Full-15.
1. Crack Isolation Membrane: Bond to substrate in accordance with membrane manufacturer's recommendations and ANSI A108.17.
  2. Provide soft joints in tile on each side of crack or joint as recommended by crack isolation membrane manufacturer.
    - a. Subject to recommendations and approval of crack isolation membrane manufacturer, soft joints may be omitted at movement joints installed in compliance with EJ171.
  3. Install epoxy grout in accordance with ANSI A108.6.

### 3.05 INTERIOR TILE INSTALLATION ON WALLS AND OTHER VERTICAL SURFACES

- A. Stone and Glass Mosaic Wall Tile –Installation Over Moisture Resistant Gypsum Board Not in Wet or Humid Areas: Install wall tile using the thin set method. Install, grout, clean, protect and cure in conformance with TCNA Handbook Methods W243-15 for glass tile and W243-15-STONE, and using latex/polymer modified Portland cement mortar and grout.
1. Stone Tile Installation: ANSI A108.5.
  2. Glass Tile Installation: ANSI A108.14, A108.15 or A108.16 as applicable.
- B. Porcelain Wall Tile and Base – Installation Over Moisture Resistant Gypsum Board: Install wall tile using the thin set method. Install, grout, clean, protect and cure in conformance with TCNA Handbook Method W243-15 and ANSI A108.5 using latex/polymer modified Portland cement mortar and epoxy grout.
1. Install epoxy grout in accordance with ANSI A108.6.

### 3.06 EXPANSION AND CONTROL JOINTS

- A. General: Comply with all requirements of TCNA Handbook Method EJ171.
- B. Locations:
1. Ceramic Floor Tile: At intersection of all ceramic floor tile and cove base, install and caulk ¼-inch wide expansion joint.
  2. Porcelain and Stone Tile: At intersection of all tile and base and elsewhere as indicated on the Drawings, install and caulk 3/8-inch wide expansion joint.
  3. Other Locations: Directly over all expansion and control joints in concrete slab below and all other locations required by EJ171.

### 3.07 SITE QUALITY CONTROL

- A. Manufacturer's Services: Setting material manufacturer's representative shall observe waterproofing-membrane installation and tiling, and shall observe and evaluate completed installation. Manufacturer's representative shall verify that proper installation practices are followed, manufacturer's installation instructions are followed, warranty requirements are met, and that installation complies with requirements of this Specification Section. Manufacturer's representative shall submit written report to Architect.

### 3.08 CLEANING AND SEALING

- A. Not less than 28 days following installation of tile grout, and just prior to occupancy of the building, clean unglazed ceramic tile with sulfamic acid and flush with clean water. When tile and joints are completely clean of cement, scum and dirt, apply manufacturer-approved sealer to floors with cement grout only. In showers or other wet areas, seal grout but do not apply sealer to floor tile or epoxy grout.
- B. Apply sealer according to manufacturer's recommendations in sufficient coats to produce an even glaze over entire floor area. Exercise care to avoid damage to adjoining surfaces.
- C. Clean all other floor and wall tile according to tile manufacturer's recommendations.

### 3.09 PROTECTION

- A. Protection of Completed Work from Physical Damage: Protect all finished work from soiling or damage caused by traffic, other trades, etc.
  - 1. Protect all flooring after setting by suitable covering.
  - 2. Replace any work showing damage or disfiguration during the progress of work in its entirety. No patching or hiding of defects will be permitted.

END OF SECTION



**SECTION 09 51 23**  
**ACOUSTICAL TILE CEILINGS**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. Adhesive applied acoustical tile and accessories.
- B. Related Requirements:
  - 1. Gypsum Board Ceilings: Section 09 29 00 Gypsum Board.
  - 2. Lay-In Acoustical Ceilings: Section 09 51 13 Acoustical Panel Ceilings.
  - 3. Paint Finish of Existing Tiles and Touchup: Section 09 91 23 Interior Painting.

1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with the following.
- B. ASTM International References:
  - 1. ASTM E1264-14 - Standard Classification for Acoustical Ceiling Products.

1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's catalog data indicating all systems proposed for installation. Include details of light fixture protection (if any) required to comply with Article "Performance."
- C. Samples: Submit full size samples of tile meeting the requirements of this specification. Architect will select from available patterns.

1.04 CLOSEOUT SUBMITTALS

- A. Extra Materials: Provide the Owner at the completion of the job one extra case acoustical tile for replacement purposes.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Deliver in manufacturer's original unopened containers and store in a clean, dry area until ready for use.

1.06 AMBIENT CONDITIONS

- A. Maintain minimum of 55 degrees F during and after installation of acoustical tile ceilings.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS AND PRODUCTS**

- A. Acceptable Manufacturers:
  - 1. Armstrong World Industries.
  - 2. CertainTeed Corporation; [www.certainteed.com](http://www.certainteed.com).
  - 3. USG Interiors, Inc.; [www.usg.com](http://www.usg.com).
- B. Tile: 3/4" x 12" x 12" matching existing edge detail and texture.
- C. Protective Edging: Chicago Metallic Corp. No. 1423 or equal, white.

### **2.02 PERFORMANCE**

- A. Acoustical Performance:
  - 1. Acoustical tile shall have a minimum noise reduction coefficient (NRC) rating of 0.60 in accordance with ASTM C423.
- B. Fire Resistance: Class A.
  - 1. Fire rating not required.

### **2.03 ADHESIVE**

- A. Adhesive: Non-water soluble type as recommended by the manufacturer.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install acoustical tile over gypsum board ceilings as indicated.
- B. Prime units with adhesive as recommended by the manufacturer. Apply four spots of adhesive placed near corners of tile. Adhesive shall be approximately 2-1/2 inches in diameter after tile has been pressed into position on the ceiling. Press units firmly into place in pattern shown on the reflected ceiling plan. All joints shall be flush and in alignment at completion of work. Clean off excess adhesive and dirt on tile as work progresses.
- C. Cut units to fit tight against walls. Wherever exposed tile edges occur install continuous protective edging nailed or glued in place prior to installation of tile.

END OF SECTION

## SECTION 09 63 41

### STONE THRESHOLDS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Marble door thresholds.
- B. Related Requirements:
  - 1. Floor Tiling: Section 09 30 00 Tiling.

##### 1.02 REFERENCES

- A. General Requirements: Refer to Section 01 42 00.
- B. Reference Standards: Comply with the following except as otherwise specified in this Project Manual.
  - 1. American National Standards Institute (ANSI) - ANSI A108 - American National Standard Specifications for Installation of Ceramic Tile:
    - ANSI A108.6-2010                      Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy.
  - 2. American National Standards Institute (ANSI) Material Specifications / Test Methods: ANSI A118.
    - ANSI A118.4-2012                      Modified Dry-Set Cement Mortar
    - ANSI A118.7-2010                      High-Performance Cement Grouts for Tile Installation
  - 3. Tile Council of North America, Inc. (TCNA): TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, 2015 Edition.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Shop Drawings: Include layout, anchoring, and jointing.
- C. Samples: Submit 12 inch sample of each type of stone threshold illustrating full range of color for acceptance.

##### 1.04 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications:
    - a. Experience: Continuously installed cut stone and tile in State of California for five years.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.

- B. Delivery and Acceptance Requirements:
  - 1. Stone Thresholds: Carefully packed and loaded for delivery. Do not use packing material that may stain or discolor stone.
- C. Storage and Handling Requirements: Carefully handle and store vertically to avoid chipping and discoloration. Protect from weather by means of non-staining waterproof covering.

#### 1.06 AMBIENT CONDITIONS

- A. Maintain materials and surrounding air to minimum 40 degrees F prior to, during, and 48 hours after completion of work.

### PART 2 PRODUCTS

#### 2.01 MARBLE THRESHOLDS

- A. Marble:
  - 1. Color and Veining: As selected by Architect.
    - a. Veining: In single direction unless approved otherwise.
- B. Thickness: 1-1/4 inch or 3/4-inch as indicated.
- C. Finish: Polished.

#### 2.02 MORTAR AND GROUT

- A. Epoxy Mortar: ANSI A118.3.
  - 1. Acceptable Products:
    - a. C-Cure ColorSet Epoxy 931.
    - b. MAPEI Kerapoxy 410.
    - c. Accepted substitute.
- B. Polymer Modified Grout: ANSI A118.7.
  - 1. Acceptable Unsanded Grout Manufacturers and Products: Required for marble flooring and polished stone flooring, and for narrow joints 1/8-inch or less in width:
    - a. Ardex Engineered Cements; [www.ardex.com](http://www.ardex.com). – Ardex Flex Unsanded Grout.
    - b. Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com) - Laticrete 1600 Unsanded Grout mixed with Laticrete 1776 Grout Enhancer.
    - c. Accepted substitute in accordance with Section 01 25 00.
  - 2. Color: As selected by Architect from manufacturer's full range.
- C. Marble Joint Filler Materials: Color matched epoxy.
  - 1. Acceptable Products:
    - a. Colored Epoxy Grout:
      - 1) C-Cure ColorSet Epoxy 931.
      - 2) Laticrete SpectraLOCK Pro Premium Grout.
      - 3) MAPEI Kerapoxy Epoxy Grout.
      - 4) Accepted substitute.
    - b. White Epoxy Grout:
      - 1) C-Cure EverWhite Epoxy 932.
      - 2) Accepted substitute.
- D. Mixing proportions and procedures shall be in strict accordance with manufacturer's recommendations.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Comply with Section 01 71 16:
  - 1. Layout: Verify layout of work before beginning installation.
  - 2. Existing Conditions: Examine substrate before beginning installation.
- B. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.
- C. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### **3.02 INSTALLATION**

- A. Marble Thresholds: Install in conformance with TCNA Handbook Method F113-15 STONE and ANSI A108.6 using color matched epoxy bond coat and epoxy joint filler. Slab shall be free of curing compound or other contaminates before proceeding.

### **3.03 CLEANING**

- A. Keep face of stone free of mortar at all times.
- B. After joint pointing, carefully clean stone. Use stainless steel wire brushes or wool to remove dirt, excess mortar, stains and other defacements. Use of other wire brushes or of acid that may cause discoloration not allowed.

### **3.04 PROTECTION**

- A. Protection of Completed Work from Physical Damage: Protect thresholds after setting by suitable boxing. Do not use lumber that may stain or deface stone. Use galvanized or other non-rusting nails for boxing.
- B. Replacement: Replace thresholds showing damage or disfiguration during progress of work in its entirety. Patching or hiding of defects not permitted.

END OF SECTION



## SECTION 09 65 16

### RESILIENT SHEET FLOORING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Sheet vinyl flooring.
- B. Related Requirements:
  - 1. Finish Legend on Drawings.
  - 2. Concrete Floor Slab Moisture Testing: Section 09 05 61 Common Work Results for Flooring Preparation.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with the following.
  - 1. ASTM International (ASTM):
    - a. ASTM F1869-04 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
    - b. ASTM F1303-04 - Sheet Vinyl Floor Covering with Backing.
    - c. ASTM F1913-04 - Vinyl Sheet Floor Covering Without Backing.
    - d. ASTM F2170-02 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
  - 2. Resilient Floor Covering Institute (RFCI):
    - a. RFCI Standard Slab Moisture Test Method (Calcium Chloride Method).
- B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
  - 1. ASTM International Standard Practices:
    - a. ASTM F710-08 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

##### 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Concrete Subfloor Vapor Emission, Alkalinity and Bond Testing and Acceptance: Coordinate with Section 09 05 61.
    - a. Notwithstanding testing by others, it is the responsibility of the flooring installer to determine whether the subfloor is sufficiently dry for covering.
- B. Sequencing:
  - 1. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations, have been completed.
- C. Scheduling:
  - 1. Material shall not be delivered or installed until all concrete, masonry and painting work are completed and all mechanical work, lighting and other overhead equipment are installed.

##### 1.04 ACTION SUBMITTALS

- A. Submittals for Review: Submit the following in accordance with Section 01 33 00:

- B. Product Data: Submit manufacturer's current printed product literature and specifications for all products proposed for installation.
- C. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories including but not limited to the following:
  - 1. Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts for corners when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.
- D. Samples: Submit a full set of samples of the brand of sheet vinyl to be used.
  - 1. Samples shall be complete and up to date.
  - 2. Colors will not be selected until samples are received.
  - 3. At the option of the Architect, full size samples may be required.
  - 4. Submit duplicate 12 inch by 12 inch (300 mm by 300 mm) sample pieces of sheet material, 12 inch (300 mm) long gully edge, cap strip, joint cover strip, or cove former as applicable.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Manufacturer's Instructions:
  - 1. Manufacturer's Installation Instructions:
    - a. Maintain one copy on site until completion of installation.

#### 1.06 CLOSEOUT SUBMITTALS

- A. Submittals for Project Record: Submit the following in accordance with Section 01 78 00.
- B. Operation and Maintenance Data: Submit manufacturer's maintenance instructions.
  - 1. Include recommended cleaning and maintenance methods and materials and frequency of cleaning.
  - 2. Include precautions against cleaning materials and methods detrimental to finishes and performance.

#### 1.07 MAINTENANCE MATERIALS SUBMITTALS

- A. Extra Materials: Upon completion of the Project, deliver the following materials to the Owner for future maintenance and repair:
  - 1. Sheet flooring pieces over 4 sq. ft.
  - 2. One gallon of each type of adhesive used.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery and Acceptance Requirements: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Handling Requirements: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
  - 1. Maintain area where materials are to be stored at 55 degrees F and less than 50 percent relative humidity.
  - 2. Store rolls in dry locations. Stand rolls on end. Protect and secure rolls from falling.



## 1.09 AMBIENT CONDITIONS

- A. General: Comply with manufacturer's recommendations.
- B. Before beginning work, building shall be warm, dry and well ventilated.
- C. Temperature Requirements: Maintain temperature in space to receive base between 70 degrees F and 90 degrees F for not less than 24 hours before and 48 hours after installation. Following 48 hour period maintain minimum temperature of 55 deg F until completion of Work.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design Manufacturer and Products: See Finish Legend on Drawings.
  - 1. Manufacturer: Mannington Resilient Floors; [www.mannington.com](http://www.mannington.com).
- B. Substitution Requests: In accordance with Section 01 25 00.

### 2.02 PERFORMANCE

- A. HUD/FHA Requirements: Exceed.
- B. Flooring Radiant Panel Test (ASTM-E648): 0.45 watts/ cm<sup>2</sup>, Pass - Class 1.
- C. N.B.S. Smoke Chamber Test (ASTM-E-662): Less than 450 – Pass.

### 2.03 SHEET VINYL FLOORING (SV) MATERIALS

- A. Homogenous Sheet Vinyl Flooring Without Backing: ASTM F1913.
  - 1. Gauge:
    - a. Overall Nominal Thickness: 0.080 inch (2.03mm).
    - b. Wearlayer Nominal Inlaid Thickness: 0.080 inch (2.03mm).
  - 2. Color: See Finish Legend on Drawings.
- B. Heterogeneous Sheet Vinyl Flooring With Backing: ASTM F1303, Type 1, Grade 1, Class B.
  - 1. Layers: Sheet flooring shall be constructed of four distinct, solid layers, consisting of a wear layer, pattern layer, interconstruction layer, and backing layer.
  - 2. Gauge:
    - a. Overall Nominal Thickness: 0.080 inch (2.03mm).
    - b. Wearlayer Nominal Inlaid Thickness: 0.020 inch (0.51mm).
- C. Heterogeneous Light Sheet Vinyl Flooring With Backing: ASTM F1303, Type 1, Grade 1, Class A.
  - 1. Gauge:
    - a. Overall Nominal Thickness: 0.080 inch (2.03mm).
    - b. Wearlayer Nominal Inlaid Thickness: 0.020 inch (0.51mm).
  - 2. Color: See Finish Legend on Drawings.

### 2.04 ACCESSORIES

- A. Adhesives: As recommended by the flooring manufacturer of the material being installed. Adhesive for vinyl edging and base shall be a type not affected by heat.

- B. Heat Welding Rod: Color matched or multi-color welding rod as supplied by the flooring manufacturer.
- C. Leveling Compound: Ardex Feather Finish or accepted substitute.
- D. Edge Strips: Metal type.
- E. Sealer and Wax: Type recommended by flooring manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Examine substrate for excessive moisture content and unevenness which would prevent execution and quality of resilient flooring as specified. Report unsatisfactory conditions to the General Contractor with copy to Architect.
  - 1. Test moisture content of concrete before installation. Coordinate with vapor emission testing requirements of Section 03 32 00. If moisture is above level acceptable to flooring or adhesive manufacturer, seal concrete surface as recommended by flooring manufacturer.
  - 2. Verify concrete subfloor to be clean, level, sound and fully cured.
- B. Acceptance: Do not proceed with installation of resilient flooring until defects have been corrected except where correction is indicated under Preparation. Beginning of installation means acceptance of existing substrate.

### **3.02 PREPARATION**

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- B. Subfloor Preparation:
  - 1. General: Prepare floor substrate in accordance with manufacturer's instructions.
  - 2. Concrete Subfloor:
    - a. Reference Standard: Comply with ASTM F710.
    - b. Cleaning, Patching and Priming: Thoroughly clean concrete floors before applying floor coverings. Remove rough spots and any foreign matter that might be evident through the floor covering. Patch minor rough areas, voids and defects with compatible leveling compound. Prime concrete floors as recommended by the manufacturer of the flooring.
    - c. Leveling: Level major uneven concrete floor joints or other irregularities by bush hammering or grinding and filling with latex type underlayment. Leveled areas shall be sanded to provide a surface level within 1/4-inch in 10 feet. Leveled areas shall be inspected by the Architect before flooring work may proceed.
  - 3. Wood Subfloor Substrate: Prepare wood subfloor substrate to be rigid, double construction with a one inch (25.4 mm) minimum thickness, free from harmful movement and have at least 18 inches of well ventilated air space below. Do not install flooring over wooden subfloors built on sleepers over, on or below grade concrete floors.
    - a. Reference Standard: Comply with ASTM F1482.
- C. Subfloor Testing:
  - 1. Concrete Moisture Test: Coordinate with Section 03 32 00. Perform moisture tests on concrete floors regardless of the age or grade level. Verify concrete substrate is dry in

accordance with the RFCI Industry Standards Slab Moisture Test Method (Calcium Chloride Method), in strict accordance with instructions.

- a. Perform moisture condition test in each major area. A minimum of 1 test per 93 m<sup>2</sup> (1000 sq.ft), prior to installation. Moisture emissions from concrete subfloors must not exceed 3 lbs per 1000sf per 24 hours (1.4 kg H<sub>2</sub>O/24 hr/93 m<sup>2</sup>) for acrylic adhesive and 5lbs for polyurethane adhesive via the Calcium Chloride Test Method (ASTM F1869).
  - b. Conduct moisture tests around room perimeter, at columns and where moisture may be evident.
2. Concrete pH Test: Perform alkali tests to ensure pH levels of concrete subfloor surface do not exceed pH 9.9. Concrete must be neutralized if above pH 9.9.
  3. Do not proceed with work until results of moisture condition and/or pH tests are acceptable.
  4. Wood Subfloors: Wood subfloors shall not exceed 10 percent moisture content when measured with a Delmhorst Wood Moisture Tester.

### 3.03 APPLICATION OF ADHESIVES

- A. General: Mix and apply adhesives in accordance with manufacturer's instruction. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer. Cover only that amount of area which can be covered by flooring material within the recommended working time of the adhesive.
- B. Application: Apply adhesive uniformly over surfaces with notched trowel or other suitable tool. Clean trowel and rework notches as necessary to insure proper application of adhesive.
- C. Cleaning: Remove any adhesive which dries or films over. Do not soil walls, bases, or adjacent areas with adhesives. Promptly remove spillage.

### 3.04 INSTALLATION

- A. General: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- B. Sheet Vinyl Flooring: Install according to manufacturer's recommendations. Rout seams with a hand router or electric router and heat weld seams using matching vinyl welding thread. Install fillet cove filler at all walls. Turn sheet flooring up wall to form integral cove base and install aluminum trim at exposed top edge.

### 3.05 CLEANING

- A. General:
  1. Remove temporary coverings and protection of adjacent work areas.
  2. Repair or replace damaged installed products.
  3. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
  4. Remove construction debris from Project site and legally dispose of debris.
- B. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer. Remove mastic cement from adjoining work with particular care to not damage such work.
- C. Sweep and vacuum floor after installation.
- D. Clean surfaces using only cleaners approved by the manufacturer.
- E. Buffing: Dry mop and buff flooring.

- F. Final Cleaning: Mop with warm water and mild detergent as recommended by manufacturer of flooring, then thoroughly machine buff.

### 3.06 PROTECTION

- A. Protect finished work from damage by subsequent construction operations.
- B. After flooring is installed, the room shall be kept locked to allow curing time for adhesive. No other trades shall be allowed on the floor until it is accepted by the Architect.
- C. Protect the newly installed flooring from foot traffic for 24 hours and heavy rolling traffic for 72 hours.

END OF SECTION

## SECTION 09 81 16

### ACOUSTIC BLANKET INSULATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Acoustical insulation in partitions as indicated.
- B. Related Requirements:
  - 1. Acoustical Joint Sealants: Section 07 92 00 Joint Sealants.

##### 1.02 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's current product literature.
- C. Samples: Submit manufacturer's sample, minimum 6 inches square.

##### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
  - 1. Protect acoustical materials from excessive moisture in shipment, storage, and handling.
- B. Delivery and Acceptance Requirements:
  - 1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying material name and manufacturer, production date and/or product code.
- C. Storage and Handling Requirements:
  - 1. Storage: Store materials in a clean, dry area in accordance with manufacturer's instructions.
  - 2. Handling: Protect materials during handling and installation to prevent damage.

#### PART 2 PRODUCTS

##### 2.01 FIBER GLASS ACOUSTICAL BLANKET INSULATION

- A. Acceptable Manufacturers:
  - 1. Johns-Manville, 800/654-3103; [www.jm.com](http://www.jm.com).
  - 2. Knauf Fiber Glass; 800/825-4434; [www.knaufusa.com](http://www.knaufusa.com).
  - 3. Accepted substitute in accordance with Section 01 25 00.
- B. Sound Control Blankets for [Non-Fire Rated] Partitions, Party Walls and Floor/Ceiling Assemblies: ASTM C665, Type 1, unfaced.
  - 1. Acceptable Products:
    - a. Knauf EcoBatt; [www.ecobatt.us](http://www.ecobatt.us).
    - b. Manville Sound Control Batts.
    - c. Accepted substitute in accordance with Section 01 25 00.
  - 2. Material: Formaldehyde-free inorganic fiber glass bonded with thermoset resin.
  - 3. Thickness: 3½ inches thick unless otherwise indicated.

4. Width: 16 inches or 24 inches to match partition wall stud spacing or joist spacing as applicable and as indicated.
5. Surface Burning Characteristics: ASTM E84.
  - a. Flame Spread: Maximum 25.
  - b. Smoke Developed: Maximum 50.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION, GENERAL**

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Install materials to comply with thermal and sound control requirements noted on Drawings.
- C. Unfaced Insulation: Not allowed in exposed applications where there is a potential for skin contact and irritation.

#### **3.02 ACOUSTICAL BLANKET INSTALLATION IN PARTITIONS**

- A. Batts: Friction-fit in place until interior finish is applied. Install batts to fill entire stud cavity. Place in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within partitions and tight to items passing through partitions.
  1. Stud Cavity Heights Up To 8 Feet: Cut lengths to friction-fit against floor and ceiling tracks or plates.
  2. Stud Cavity Heights Greater Than 8 Feet: Provide supplemental support as required to hold batts in place until the interior finish is applied.

END OF SECTION

## SECTION 09 91 23

### INTERIOR PAINTING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
1. Paint all new or patched interior surfaces.
  2. Interior painting.
  3. Touch up painting of existing surfaces abraded or otherwise damaged by construction operations.
  4. Painting existing acoustical ceiling tiles.
  5. Includes:
    - a. Surface preparation, priming and field application of finish coat(s) to all exterior surfaces not specifically excluded.
    - b. Surface preparation, priming and field application of finish coat(s) to all interior surfaces not specifically excluded.
    - c. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- B. Exclusions: In addition to material obviously not requiring paint such as glass, floor, tile, etc. do not paint or finish:
1. Surfaces indicated by the Finish Schedule to remain unfinished.
  2. Factory finished surfaces unless otherwise specified.
  3. Concealed surfaces.
  4. Operating parts.
  5. Labels.
  6. Existing surfaces not included in the Work.
- C. Related Requirements:
1. Primer for Metal Fabrications: Section 05 50 00 Metal Fabrications.
  2. Piping Identification: Section 22 05 53 Identification For Plumbing Piping And Equipment.

##### 1.02 REFERENCES

- A. Definitions:
1. Terminology: ASTM D16-12 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
  2. Coat: An application of paint or coating that is allowed to dry prior to subsequent application.
  3. Sheen Terms:
    - a. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
    - b. Eggshell: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
    - c. Semigloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
    - d. Full Gloss: High-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Material List: Immediately after award of the contract submit a letter listing the manufacturer and product name of each different paint and coating material for use on the Project. Do not order materials before Material List has been accepted by the Architect.
- C. Paint Samples: If requested by Architect, prepare and submit paint samples. Remake samples until accepted.

### 1.04 MAINTENANCE MATERIALS SUBMITTALS

- A. Extra Paint: At the completion of painting, deliver to the Owner one full gallon of each paint color and type used along with the color number or formula for each type.
  - 1. Epoxy and high performance coatings are not included.

### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Applicator Qualifications: Applicator shall have minimum 5 years' experience and shall have successfully completed commercial work of similar scale to this Project.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery and Acceptance Requirements: Deliver materials required for painting in unbroken packages bearing the brand and name of manufacturer. Order materials sufficiently in advance to be on the job when needed and deliver at the building in sufficient quantities so the work will not be delayed. No claim by the Contractor concerning unsuitability of any material specified or his inability to produce first-class work with the same, will be entertained unless such claim is made, in writing, with the material list submittal.
- C. Storage and Mixing: Painter will be assigned a room or space in which to mix or store material. Provide galvanized mixing pans for this paint room or space in which paints shall be mixed. No mixing of paint shall be done except in these pans. Empty containers bearing the name or brand of any manufacturer shall not be brought upon the premises for mixing of paint unless labels are canceled and containers are closely marked as to contents.
  - 1. Inspection: The paint storage area shall be open for periodic inspection by the Architect to ensure only approved materials are being used.

### 1.07 AMBIENT CONDITIONS

- A. Apply coating under following conditions only.
  - 1. Temperature of Air: Between 50 and 100 degrees F.
  - 2. Temperature of Substrate: Between 50 and 100 degrees F and above dew point.
  - 3. Lighting: Maintain 80 foot candles minimum on surfaces to be finished.



## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: The best quality materials as manufactured by any of the following manufacturers will be acceptable: (Paint Only):
1. For Brush, Roller or Spray Work:
    - a. Benjamin Moore & Co.; [www.benjaminmoore.com](http://www.benjaminmoore.com).
    - b. Dunn-Edwards Corporation; [www.dunnedwards.com](http://www.dunnedwards.com).
    - c. Frazee Paint, division of the Comex Group; [www.frazeepaint.com](http://www.frazeepaint.com).
    - d. Glidden Professional Brand of PPG Architectural Coatings; [www.gliddenprofessional.com](http://www.gliddenprofessional.com).
    - e. Kelly-Moore Paint Company; [www.kellymoore.com](http://www.kellymoore.com).
    - f. PPG Pittsburgh Paints; [www.ppgpittsburghpaints.com](http://www.ppgpittsburghpaints.com).
    - g. Pratt & Lambert, Inc.; [www.prattandlambert.com](http://www.prattandlambert.com).
    - h. Sherwin-Williams Company; [www.sherwin-williams.com](http://www.sherwin-williams.com).
  2. Touch-up Paint for Acoustical Tile and Panel Ceilings:
    - a. Armstrong World Industries; [www.armstrong.com](http://www.armstrong.com) – SuperCoat.
- B. Substitution Requests: Required for all manufacturers and products not named as Basis of Design or as Acceptable Manufacturer.
1. Requests for substitutions must be on company letterhead and signed by an authorized representative of the manufacturer. Letters from sales representatives or retailers will not be acceptable.
  2. Submissions: Submit in accordance with Section 01 25 00.

### 2.02 REGULATORY REQUIREMENTS

- A. Regulatory Requirements: Product shall be certified to meet the following.
1. Volatile Organic Content (VOC): Paint and coating materials shall not exceed VOC content limitations of all applicable regulations, when thinned to manufacturer's maximum recommendation.

### 2.03 MATERIALS

- A. Quality: All products not specified by name shall be "best grade" or "first line" products or acceptable manufacturers. See Part 3 Execution for materials required for this Project. Where possible, materials shall be of a single manufacturer.
- B. Volatile Organic Content (VOC): In addition to meeting all applicable regulations, paint and coating materials shall be certified to not exceed following VOC content limitations when thinned to manufacturer's maximum recommendation.
1. Architectural Paints, Coatings, and Primers Applied to Interior Walls and Ceilings:
    - a. Flat: VOC content less than 50 grams/liter.
    - b. Non-Flats: VOC content less than 150 grams/liter.
    - c. Eggshell Interior Finish Coat: VOC content less than 150 grams/liter.
  2. Anti-Corrosive and Anti Rust Paints Applied to Interior Ferrous Metal Substrates: VOC content less than 250 grams/liter.
  3. Epoxy: Waterborne epoxy; maximum VOC content 200 grams/liter.
  4. Clear Wood Finishes, Floor Coatings, Stains, Sealers, and Shellacs Applied to Interior Elements:
    - a. Clear Wood Finishes: Varnish VOC content less than 350 grams/liter; lacquer VOC content less than 550 grams/liter.
    - b. Floor Coatings: VOC content less than 100 grams/liter.

- c. Sealers: Waterproofing sealers VOC content less than 250 grams/liter; sanding sealers VOC content less than 275 grams/liter; all other sealers VOC content less than 200 grams/liter.
  - d. Stains: VOC content less than 250 grams/liter.
  - 5. Paint Strippers – Low-Emitting: Shall not contain methylene chloride. Avoid products containing methanol and trichloroethane.
- C. Colors: The Architect will provide a color schedule listing paint colors selected. Color selections will be made by the Architect from color systems of recognized paint company. If materials of other manufacturers are used, colors must match those selected.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included under Preparation.
- B. Report unsatisfactory conditions to the General Contractor in writing with copy to the Architect.
- C. Acceptance: Beginning of application means acceptance of existing surfaces.

### **3.02 PREPARATION**

- A. General:
  - 1. Spaces: Clean before finishing is started. Do not finish rooms or spaces where rubbish has accumulated or while rubbish is being removed. Finishing not allowed in dusty rooms.
  - 2. Sand finishes on wood and metal surfaces between coats to ensure smoothness and adhesion of subsequent coats. Use extra fine sandpaper to avoid cutting the edges when sanding. Apply putty or spackling compound after surfaces are primed and primer is dry. Bring material flush with adjoining surfaces.
  - 3. Existing Surfaces: If the surfaces are not in proper shape for painting or finishing, repair, rebuild or refinish before proceeding with the work. Be responsible for any poor work caused by improper surfaces. Surfaces shall be dry, clean and smooth before starting work. Fill cracks, holes or checks full and make smooth before finish is applied to surfaces. Fill any cracks, etc., which occur after walls are sized.
- B. Metals:
  - 1. Ferrous Metal: Remove foreign material, rust and mill scale from unprimed metal.
    - a. Wire brush or sand damaged or rusted areas to bright metal.
    - b. Remove grease and other foreign materials with mineral spirits.
    - c. Dust clean.
  - 2. Shop Primed Metals: Touch-up shop primed metals with a primer similar to the existing. Sand shop primer on hollow metal work immediately before painting to remove grease and dirt film from surfaces.
  - 3. Zinc Coated Metal (Galvanized Surfaces): Solvent clean with mineral spirits or other acceptable solvent in accordance with SSPC-SP1 to remove all residue oil, grease or other contamination. Prime as specified.
  - 4. Non-ferrous Metals: Clean with lacquer thinner.
- C. Acoustical Ceiling Tiles and Panels:
  - 1. Remove loose dust from material with a brush or vacuum cleaner attachment.

- D. Wood:
1. Interior Wood Surfaces to be Painted: Remove sap on surface by solvent-wiping. Touch-up resinous areas and knots with two coats of shellac. Fill voids with a high quality, lead-free paste wood filler after primer is dry.
  2. Interior Wood to be Clear Finished: Sand smooth and free of marks. Fill voids and nail holes after first coat is dry using a filler compatible with the finish system and matching color.
- E. Protection:
1. Furnish and lay drop cloths or mask off areas where finishing is being done to protect floors and other work from damage during the execution of work.
  2. Remove items which are not to be coated from surfaces which are to be coated. Reinstall items after completion of coating application. Include mechanical grilles and factory finished items.
  3. Where it becomes necessary to remove temporary coverings placed by others, replace same in proper manner.
  4. Remove empty cans, oily rags and waste from the building every night. Do not allow to accumulate.
  5. Damage to Work of Others: Be responsible for any damage done to the work of other trades, repairing same to the satisfaction of the Architect. Replace any materials damaged to such an extent that they cannot be restored to their original condition.

### 3.03 APPLICATION

- A. Painting and Staining, General: Apply primer and two finish coats unless otherwise noted.
1. The application of the first coat does not relieve the applicator of responsibility for the base.
  2. Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.
- B. Primer: Apply as many coats as necessary to produce a uniform substrate appearance. Do not exceed manufacturer's recommended coverage rate.
1. Tint primers to match finish coat.
  2. Allow to dry prior to application of subsequent coats.
  3. Sand primer with 100 grit or finer sandpaper. Remove dust.
- C. Application of Finish Coats: Spread materials evenly without runs or sagging of materials and thoroughly brush out.
1. Second and third coats shall not be applied until preceding coat is dry.
  2. Sand work between coats.
  3. Colors: Each finish coat shall be color as selected by Architect.
- D. Roller Application: Where paint or enamel is rolled on, use fine nap roller so nearly flat or orange peel texture is obtained.
1. Painting Existing Acoustical Ceiling Suspension Grid: Paint exposed surfaces of grid by spray, brush or roll coating. If necessary to achieve complete hiding and finish, apply in two coats.
- E. Spray Application:
1. Metals: Apply paint to all metals by spray application method.
  2. Acoustical Tiles and Panels: Apply paint to acoustical tiles and panels by spray application.
    - a. Existing Surfaces: Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.
    - b. Apply paint with a stream directed perpendicularly to the surface of the material. Apply to produce uniform coating that does not close the perforations or fissures in the material.

- c. Apply in single coat unless second coat is required to hide stains. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

3.04 MISCELLANEOUS REQUIREMENTS

- A. Mechanical Piping and Ductwork: Wherever insulated pipe or ductwork occurs in rooms where walls are finished, cover canvas jacket with one coat sealer and two coats flat wall paint. Wherever uninsulated piping or ductwork occurs in rooms where walls are finished or elsewhere as called for, finish pipes as called for under ferrous zinc coated, or factory primed metals. See Division 22 for identification markings.
- B. Electrical Wiremold: Paint to match wall on which installed.

3.05 CLEANING

- A. Do not remove rubbish while finish is fresh. Surfaces: Dry and clean.
- B. Clean-up Materials: Non-abrasive mild detergent, cellulose sponge and potable water.
- C. Clean up overspray and spills.
- D. Remove masking.
- E. Allow at least 7 days after application before washing.
- F. Final Cleaning: At the completion of work, remove all surplus materials, staging, rubbish; clean off all paint, varnish, stains from floors, glass, walls, hardware; and leave the premises in clean condition.

3.06 PROTECTION

- A. Protect coating from damage.
- B. Touch up and repair coatings damaged by Work.

3.07 COATING SYSTEM - INTERIOR

- A. General:
  - 1. Paint and coating systems shall meet following scheduled requirements as a minimum.
  - 2. Delete primer when re-coating existing surfaces.
- B. Ferrous, Zinc Coated or Factory-Primed Metals - Painted:

First Coat	Factory Primer Coat or Suitable Primer
Second Coat	Enamel Undercoat
Third Coat	Semi-Gloss Enamel

- C. Hollow Metal Frames - Painted:

First Coat	Factory-Prime Coat (Sanded)
Second Coat	Enamel Undercoat
Third Coat	Semi-Gloss Enamel

D. Woodwork and Wood Doors - Painted:

First Coat	Suitable Primer
Second Coat	Enamel Undercoat
Third Coat	Semi-Gloss Enamel

E. Gypsum Board - Painted:

First Coat	Suitable Primer
Second Coat	Latex Enamel, Semi-Gloss
Third Coat	Latex Enamel, Semi-Gloss

F. Acoustical Tiles and Panels - Painted:

First Coat	Latex, Eggshell
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END OF SECTION



**DIVISION 10 - SPECIALTIES**  
**SECTION 10 21 23**  
**CUBICLE CURTAINS AND TRACK**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. Privacy curtain track as indicated.
  - 2. Privacy curtain.
- B. Related Requirements:
  - 1. Acoustical Panel Ceilings: Section 09 51 13.

1.02 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Manufacturer's current product data sheets describing products to be supplied with all selected options clearly identified, basic uses, materials, precautions and limitations, applicable standards, approvals, and general installation procedures.
- C. Shop Drawings: Submit drawings indicating track layout and support details.
- D. Samples: Verification samples of cubicle track, 4 inches (102mm) long, in full size, with carriers and end cap.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Deliver materials in unopened factory packaging to the jobsite.
  - 2. Inspect materials at delivery to ensure that specified products have been received.
- B. Storage and Handling Requirements: Store in original packaging in a climate controlled location away from direct sunlight.

1.04 AMBIENT CONDITIONS

- A. Products shall be installed in an interior climate controlled environment.

1.05 WARRANTY

- A. Provide manufacturer's standard lifetime warranty against material and manufacturing defects.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design Privacy Curtain Manufacturer and Product: See Finish Legend on Drawings.

- B. Acceptable Track Manufacturers:
  - 1. Capital Cubicle Co. Inc.
  - 2. Construction Specialties Inc.
  - 3. General Cubicle Co.
  - 4. Interspec.
- C. Substitution Requests: Submit in accordance with Section 01 25 00.

## 2.02 CUBICLE CURTAIN

- A. Provide "Firewall Cloth", UL- rated as "Non-Combustible."
- B. Provide curtain materials colorfast, sanitized, and free from odors, noxious gases or otherwise dangerous fumes when subjected to open flame.
- C. Provide all seams turned in and securely sewed.
- D. Provide flexible, sewn, reinforced eyelets spaced 6 inches on center. Use in lieu of metal grommets.
- E. Provide curtain width at least 10 percent greater than track length. Hang to within 15 inches of floor.
- F. Mesh: See Finish Legend on Drawings.
- G. Color: See Finish Legend on Drawings.

## 2.03 CUBICLE TRACK AND HARDWARE

- A. Track:
  - 1. Provide track of anodized extruded aluminum box channel 1-3/8 inch o.d. by 3/4-inch o.d. slotted on the underside to receive two wheel carriers.
  - 2. For L-shaped cubicles, with legs 6'-0" and over, form track of one continuous piece of track with integral 90 degree bend on a 12 inch radius.
  - 3. Where layout precludes one piece construction, use an external, extruded aluminum connector, with a finish matching the track at each joint.
- B. End Closers: Use at both ends of the cubicle with a removable section at one end to permit easy entry and removal of curtains.
- C. Curtain Carriers: Formed of rustproof wire and bead chain riding on a carrier with nylon wheels. Quantity of carriers shall be computed at 2.2 carriers per foot of track.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Locate the cubicle track as indicated on the approved shop drawings and in compliance with the manufacturer's installation instructions.
- B. Installation of Cubicle Tracking Systems:
  - 1. Install cubicle track, secure, rigid, and true to ceiling line.
  - 2. Secure or suspend track to ceiling system. Install with mechanical fasteners or clips.



3. Slide carriers onto the track.
4. Install end cap or stop device.

C. Curtains: Install curtains on carriers ensuring smooth operation.

### 3.02 CLEANING

- A. At completion of the installation, remove any debris and clean surfaces in accordance with the manufacturer's clean up and maintenance instructions.

END OF SECTION



## SECTION 10 26 13

### CORNER GUARDS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Vinyl corner guards.

##### 1.02 COORDINATION

- A. Coordinate installation with wall construction, including concealed blocking or anchoring devices, installation of wall base, and painting.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's current product literature.
- C. Shop Drawings: Submit shop drawings indicating dimensions, locations, types, sizes, and finishes.
- D. Samples: Submit two 24 inch sections of corner guards illustrating component design, configuration, color, and finish.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design Manufacturer and Product:
  - 1. Manufacturer: Construction Specialties, Inc. (C/S).
  - 2. Model: Acrovyn SSM-25 Series. Color as selected or scheduled.
- B. Substitution Requests: In accordance with Section 01 25 00.

##### 2.02 CORNER GUARDS

- A. Description: Snap-on covers of Class 1 fire-rated resilient material, minimum 0.078 inch thick, free-floated over continuous retainer, surface-mounted and anchored to wall at 20 inches on center maximum; molded end caps color matched to covers.
- B. Size: 2-inches by 2-inches by 4 feet high.

##### 2.03 FABRICATION

- A. Fabricate components with tight joints, corners, and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

## 2.04 ACCESSORIES

- A. Provide attachment accessories as recommended by corner guard manufacturer.
- B. Fasteners: Bugle head screws.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verification of Conditions: Verify of existing conditions before starting work. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
- B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

### 3.02 INSTALLATION

- A. Install over corners in accordance with manufacturer's published instructions, square and plumb, secured rigidly in position.
- B. Butt bottom of corner guard to top of base; top of corner guard 7 feet above finish floor.

END OF SECTION

## SECTION 10 26 23

### PROTECTIVE WALL COVERING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Plastic, impact-resistant, wall protection panels.
- B. Related Requirements:
  - 1. Corner Guards: Section 10 26 13.

##### 1.02 SEQUENCING

- A. Apply panels to gypsum board substrate before adjacent gypsum board is painted.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's current catalog literature and technical data for each product supplied under this Section.
- C. Shop Drawings: Submit detail drawings indicating mounting details with the appropriate fasteners for indicated substrate materials.
- D. Samples: Submit 8 inch long samples in full size profile for verification of each product type and color indicated.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Test Reports: Include product test data demonstrating compliance with specified standards.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Submit the following in accordance with Section 01 78 00.
  - 1. Submit cleaning and maintenance instructions for Owner's information.
  - 2. Warranty.

##### 1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Fire Performance: Wall panels shall meet requirements for NFPA Class A fire rating.
  - 2. Wall Panels: UL labeled.

##### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Comply with Section 01 60 00.
- B. Delivery: Deliver sheets in cartons. Deliver adhesive in sealed containers.

- C. Storage: Store products in original packaging in climate controlled area away from direct sunlight.
- D. Handling: Protect surface of panels during handling and installation.

#### 1.08 SITE CONDITIONS

- A. Ambient Conditions: During installation and for not less than 48 hours before installation, maintain room temperature required for adhesive being used.
- B. Protection: Provide ventilation to disperse fumes during application of adhesive. Allow no containers of adhesive to be opened until all potential sources of flame or spark have been shut down or extinguished and until warning signs have been posted.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design Manufacturer and Product: See Finish Legend on Drawings.
  - 1. Construction Specialties, Inc. – Acrovyn.
  - 2. Color, Texture and Joint Detail: As indicated on Finish Legend.
- B. Substitution Requests: In accordance with Section 01 25 00.

#### 2.02 MATERIALS

- A. Wall Protection Panels: Vinyl/acrylic panels of gage indicated on Finish Legend.
  - 1. Size: Height as indicated by length required in one piece.
- B. Adhesive: Contact type as recommended by the manufacturer and complying with Southern California VOC regulations.
- C. Accessories and Trim: Manufacturer's standard vinyl/acrylic alloy moldings and trim.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verification of Existing Conditions: Examine surfaces scheduled to receive panels for conditions that will adversely affect execution, permanence or quality of work. Report unsatisfactory conditions to the General Contractor in writing with copy to Architect.
- B. Acceptance: Beginning of application means acceptance of existing surfaces.

#### 3.02 PREPARATION

- A. All wall surfaces to be smooth, level, clean, dry and free of any irregularities to provide a good adhesive grip and smooth application of wall panels.

#### 3.03 INSTALLATION

- A. General: Install panels in accordance with the manufacturer's recommendations.

- B. Adhesive: Comply with manufacturer's instructions regarding method of application, spread rate, drying time, open time and temperature and humidity limitations.
- C. Panels: Align and plumb the first sheet before allowing the glue lines to come together, then apply the sheet slowly from one side to the other to expel air. Roll uniformly with hard rubber roller.
- D. Install rigid sheets beveled at seams and chemically sealed. Butt adjoining panels tight, in straight, even line. Install panels without top cap, vertical divider bars, inside corner trim, or other joint accessories and trim unless otherwise detailed on Interior Design Drawings.
- E. Trim: Install trim at all exposed edges and outside corners.

#### 3.04 CLEANING

- A. Immediately remove any adhesive from face of panels using solvent recommended by panel manufacturer. Keep faces clean during application.

END OF SECTION





**SECTION 10 28 13**  
**TOILET ACCESSORIES**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section Includes:
  - 1. Washroom accessories as indicated and specified.
  - 2. Wrap for exposed pipes under lavatories.

1.02 REFERENCES

- A. Reference Standards: Comply with the following as applicable:
  - 1. United States Department of Justice – 2010 ADA Standards for Accessible Design, September 15, 2010; available at [www.ada.gov/ADAStandards\\_index.htm](http://www.ada.gov/ADAStandards_index.htm).

1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit manufacturer's current product literature.

**PART 2 PRODUCTS**

2.01 TOILET ACCESSORIES

- A. Owner Furnished-Contractor Installed (OFCI) Accessories: See Equipment Schedule on Drawings.
- B. Toilet Room Mirrors:
  - 1. Acceptable Manufacturers:
    - a. A&J Washroom Accessories.
    - b. American Specialties, Inc. (ASI).
    - c. Bobrick Washroom Equipment, Inc.
    - d. Bradley Corporation.
    - e. General Accessory Mfg. Co. (GAMCO).
    - f. McKinney/Parker Washroom Accessories.
  - 2. Types and Sizes: As indicated on Drawings.

2.02 LAVATORY PIPE WRAP

- A. Acceptable Manufacturers:
  - 1. Plumberex Specialty Products, Inc.
  - 2. Truebro, Inc.
- B. Regulatory Requirements:
  - 1. Comply with standards of ADAAG.
  - 2. Sharp or Abrasive Surfaces: Not allowed under lavatories.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions:
  - 1. Verify solid blocking in partitions and walls as required for proper support of toilet accessories.
  - 2. Report unsatisfactory conditions to General Contractor in writing with copy to Architect.

### **3.02 INSTALLATION**

- A. Fasten accessories rigidly and securely to walls using methods and materials recommended by manufacturer.
- B. Locate and mount at heights complying with local, state and ADA Standards.
- C. Pipe Wrap: Install in accordance with Manufacturer's recommendations.
  - 1. Insulate all hot water and drain pipes under lavatories unless otherwise configured to protect against contact with users.

### **3.03 ADJUSTMENT**

- ~~A.~~ A. Before final inspection, inspect each accessory installation for rigid and secure installation. Take action necessary for rigid and secure installations.

END OF SECTION

## **DIVISION 12 - FURNISHINGS**

### **SECTION 12 24 13**

#### **ROLLER WINDOW SHADES**

##### **PART 1 GENERAL**

###### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Sunscreen roller shades.

###### **1.02 ACTION SUBMITTALS**

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Manufacturer's current product data sheets describing all products to be supplied under this Section, with all selected options clearly identified, basic uses, materials, precautions and limitations, applicable standards, approvals, and general installation procedures. Include the following.
  - 1. Styles, material descriptions, dimensions of individual components, profiles, features, finishes.
  - 2. Mounting details.
- C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- D. Samples:
  - 1. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
  - 2. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

###### **1.03 INFORMATIONAL SUBMITTALS**

- A. Procedures: Submit for information and verification in accordance with Section 01 33 00.
- B. Manufacturer's Instructions: Submit the following. Maintain one copy of each on site until completion of installation.
  - 1. Preparation instructions and recommendations.
  - 2. Installation instructions.

###### **1.04 CLOSEOUT SUBMITTALS**

- A. Submit in accordance with Section 01 78 00.
  - 1. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
  - 2. Operating instructions.
  - 3. Warranties.

## 1.05 QUALITY ASSURANCE

### A. Qualifications:

1. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- ### A. Delivery and Acceptance Requirements:
- Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

## 1.07 AMBIENT CONDITIONS

- ### A. Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## 1.08 WARRANTY

- ### A. Roller Shade Hardware and Chain Warranty:
- Manufacturer's standard non-depreciating twenty-five year limited warranty.
- ### B. Standard Shadecloth:
- Manufacturer's standard twenty-five year warranty.
- ### C. Roller Shade Installation:
- One year from date of Substantial Completion.

## **PART 2 PRODUCTS**

### 2.01 MANUFACTURERS AND PRODUCTS

- ### A. Basis of Design Manufacturer and Products:
- See Finish Legend on Drawings.
1. Manufacturer: MechoShade Systems, Inc.; [www.mechoshade.com](http://www.mechoshade.com).
  2. Shadecloth Product: ThermoVeil 1010. Light Grey.
  3. Drive Bracket: Model M5.
- ### B. Substitution Requests:
- In accordance with Section 01 25 00.

### 2.02 DESCRIPTION

- ### A. Roller Shade Operation:
- Manual.
- ### B. Mounting:
- Surface mounted with fascia.
- ### C. Configuration:
- Single solar shadecloth. Separate section in each window section.
- ### D. Hardware:
- Provide all operating hardware and support brackets.
1. Access Requirements:
    - a. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
    - b. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

## 2.03 PERFORMANCE

- A. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- B. Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi.

## 2.04 OPERATING HARDWARE

- A. Manual Operated Chain Drive Hardware and Brackets:
  - 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
  - 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
  - 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
  - 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to ensure alignment from the first to the last shade band.
  - 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
  - 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
  - 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
  - 8. Drive Bracket / Brake Assembly:
    - a. Drive bracket shall be fully integrated with all accessories, including, but not limited to: fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
    - b. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
    - c. The entire assembly shall be fully mounted on steel support bracket, and shall be fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
    - d. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

## 2.05 SOLAR SHADECLOTH MATERIAL

- A. Shadecloth: Single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl.
  - 1. 2 to 3 percent open.
  - 2. Color: See Finish Legend on Drawings.

## 2.06 SHADE BAND ASSEMBLY

- A. General: Construction of shade band to include the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

- B. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
- C. Shade Band and Shade Roller Attachment:
  - 1. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter are not acceptable.
  - 2. Provide for positive mechanical engagement with drive / brake mechanism.
  - 3. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
  - 4. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
  - 5. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

## 2.07 FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
- B. Provide battens in standard shades as required to ensure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for ensuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to ensure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, ensure proper use of seams or battens as required to, and ensure the proper tracking of the railroaded multi-width shadebands.
- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to ensure proper tracking and roll of shadebands.

## 2.08 ACCESSORIES

- A. Fascia: Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
  - 1. Fascia shall be able to be installed across two or more shade bands in one piece.
  - 2. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
  - 3. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
  - 4. Notching of fascia for manual chain shall not be acceptable.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.

### **3.03 INSTALLATION**

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

### **3.04 CLEANING**

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

### **3.05 CLOSEOUT ACTIVITIES**

- A. Training: Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

### **3.06 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION





## SECTION 12 36 61

### SIMULATED STONE COUNTERTOPS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Solid surfacing for countertops.
- B. Related Requirements:
  - 1. Steel Supports: Section 05 50 00 Metal Fabrications.
  - 2. Plywood Subtops, Custom Cabinet and Countertop Construction: Section 06 41 00 Architectural Casework.

##### 1.02 REFERENCES

- A. Reference Standards: See Section 01 42 00. Comply with following:
  - 1. Architectural Woodwork Institute (AWI) and the Woodwork Institute (WI) – Architectural Woodwork Standards (AWS), Second Edition, 2014.
    - a. Unless otherwise indicated, comply with AWS for grades of interior architectural woodwork, construction, finishes and other requirements.
      - 1) Comply with Custom Grade if not otherwise specified.

##### 1.03 ACTION SUBMITTALS

- A. Procedures: Submit for review, acceptance and return in accordance with Section 01 33 00.
- B. Product Data: Submit catalog data for all countertop surfacing materials and countertop setting and grouting materials.
- C. Shop Drawings: Include the following.
  - a. Overall layout of countertop work.
  - b. Type, thickness, and details of countertop materials and components.
  - c. Joints, attachment and anchoring of components.
- D. Samples: Submit three sets of samples not less than 12-inch by 12-inch in size of each different color and finish of solid surfacing required. Include in each set the full range of exposed color and texture to be expected in the completed work. Review will be for color and texture only. Retain samples during construction as a standard for judging completed work.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Submit the following in accordance with Section 01783.
  - 1. Maintenance Data: Submit for countertop surfacing materials. Include cleaning instructions, scratch removal procedures and materials harmful to facing.

##### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Provide supervision of installation by workmen skilled in this type of work with at least 5 years' experience in the installation of similar systems.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver no components to project site until areas are ready for installation.
- B. Storage: Store components indoors prior to installation.
- C. Handling: Handle materials to prevent damage to finished surfaces.
  - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

## 1.07 AMBIENT CONDITIONS

- A. Solid Surfacing: Maintain ambient temperature between 50 and 95 degrees F for 48 hour before, during, and for minimum 7 days after installation of countertops.
- B. Comply with minimum temperature requirements of bonding and grouting materials manufacturers.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design Manufacturers and Products: See Finish Legend on Drawings.
- B. Substitution Requests: In accordance with Section 01 25 00.

### 2.02 MATERIALS

- A. Solid Surfacing Material: Solid, nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment with through body colors meeting ANSI Z124.3 or ANSI Z124.6.
  - 1. Size: 1/2 inch thick by width indicated.
  - 2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

### 2.03 FABRICATION

- A. Field Measurements: Before fabricating countertops, verify shapes and dimensions of surfaces to be covered.
- B. AWI Grade: Construct counters as indicated on Drawings and as required for AWI Custom Grade work.
- C. Solid Surfacing Fabrication: Cut accurately to shape and dimensions shown on final shop drawings. Comply with the fabrication tolerances for the specified finishes.
  - 1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
  - 2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Dress joints (bed and vertical) straight and at 90 degree angle to face unless otherwise shown.
    - a. Reinforce with strip of solid polymer material, 2-inch wide.

- b. Joint Width: Cut for 1/8-inch joint width. Saw cut or roughly dress back surfaces that will be concealed in the finish work to approximately true planes. Fabricate work to profiles shown, with arises sharp and true, and match at joints between units.
- 3. Provide corners as detailed.
- 4. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
- 5. Rout and finish component edges with clean, sharp returns.
  - a. Rout cutouts, radii and contours to template.
  - b. Smooth edges.
  - c. Repair or reject defective and inaccurate work.
- 6. Fabrication Tolerances:
  - a. Squareness: Panels shall have a maximum out of square (difference in length of the two diagonal face measurements) differential of not greater than 1/8-inch per 10 feet.
  - b. Warpage: Faces of panels shall not be out of plane more than 1/8-inch for each 10 feet of either height or width.

## 2.04 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
- B. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.
- C. Sink/Lavatory Mounting Hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.
- D. Conductive Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- E. Insulating Felt Tape: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions:
  - 1. Layout: Verify layout of work before beginning installation.
  - 2. Existing Conditions: Before beginning installation, examine surfaces to receive facing for defects or conditions adversely affecting quality and execution of installation.
  - 3. Allowable Substrate Tolerances:
    - a. Maximum variation in substrate surface: 1/8 inch in 8 feet.
    - b. Maximum height of abrupt irregularities: 1/32 inch.
  - 4. Notification: Notify Contractor and Architect of unsatisfactory conditions in writing.
- B. Acceptance: Beginning of work means acceptance of existing conditions by installer.

### 3.02 PREPARATION

- A. Protection: Protect adjoining work surfaces before work begins.

- B. Cleaning:
  - 1. Clean surfaces to remove loose and foreign matter that could impair adhesion.
  - 2. Clean panels before setting as recommended by Manufacturer.
- C. Surface Preparation: Where possible, correct substrate to conform to allowable substrate tolerances specified. Remove ridges and projections. Fill voids and depressions with patching compound compatible with setting materials and as recommended by Manufacturer.

### 3.03 INSTALLATION

- A. Solid Surfacing, General: Cut to size, seamed and installed with moisture-insensitive adhesive in accordance with Manufacturer's recommendations and as indicated on accepted shop drawings.
  - 1. Set with 1/8-inch joints between interior units.
  - 2. Minimize joints and pieces less than one half size.
  - 3. Job Cutting: Cut to size, seamed in accordance with Manufacturer's recommendations and as indicated on accepted shop drawings.
    - a. Employ skilled fitters for necessary cutting as the work progresses.
    - b. Locate cuts to be inconspicuous.
    - c. Fit units around projections and at perimeter.
    - d. Smooth and clean cut edges.
    - e. Ensure that trim will completely cover cut edges.
  - 4. Adjustments: Sound surfacing after setting. Replace hollow sounding units.
- B. Counters: Construct supports for counters as indicated. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data. Securely attach counters to walls and casework, plumb and level.
  - 1. Provide product in the largest pieces available.
  - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
    - a. Exposed joints/seams shall not be allowed.
  - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
  - 4. Cut and finish component edges with clean, sharp returns.
  - 5. Rout radii and contours to template.
  - 6. Anchor securely to base cabinets or other supports.
  - 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
  - 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  - 9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- C. Coved backsplashes and applied sidesplashes:
  - 1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
  - 2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

### 3.04 CLEANING

- A. Cleaning Solid Surfacing: Clean surfacing not less than 2 days after placement with non-abrasive cleaner. Follow manufacturer's instructions.

3.05 PROTECTION

- A. Protection: Protect completed work.

END OF SECTION



**SECTION 22 00 10**  
**BASIC PLUMBING REQUIREMENTS**

**PART 1. GENERAL**

**1.01 SECTION INCLUDES**

- A. Basic Plumbing Requirements specifically applicable to Division 22 Sections, in addition to Division 01 - General Requirements.

**1.02 DESCRIPTION**

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

**1.03 WORK INCLUDED**

- A. The complete Plumbing systems (including Fire Protection systems), including but not limited to these major items.
  1. Coordinate work of this Section with related trades.
  2. Verify applicable dimensions at the jobsite.
  3. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
  4. Soil waste and vent system inside and outside the building including connections to fixtures, equipment, sewer connections, clean-outs.
  5. Water piping systems inside and outside the building, including connections to fixtures, equipment, water meters and vaults; pressure regulating stations, backflow preventers.
  6. Interruptible and non-interruptible fuel gas systems inside and outside the building, including connections, gas meters, earthquake valves, and pressure regulating stations.
  7. Plumbing fixtures, carriers, fittings, trim, hose bibs, wall hydrants, and accessories.
  8. Installation and connection of Owner furnished equipment.
  9. Natural gas piping system including connections to equipment and site.
  10. Water heating systems, including water heating equipment, circulating pumps, connections.
  11. Shop drawings.
  12. Equipment identification.
  13. Equipment and systems adjustments and balancing.
  14. Air, water and gas systems testing, adjusting and balancing.
  15. Written operating and maintenance instructions.
  16. Record drawings.
  17. Guarantee

**1.04 WORK SPECIFIED ELSEWHERE**

- A. Concrete, Architectural Sheet Metal, Door and Exterior Wall Louvers, Painting and Electrical.

**1.05 SITE INSPECTION**

- A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

**1.06 ORDINANCES, REGULATIONS AND CODES**

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.
  1. AFI - Air Filter Institute
  2. AMCA - Air Moving & Conditioning Association
  3. ARI - Air Conditioning & Refrigeration Institute
  4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
  5. ASME - American Society of Mechanical Engineers

6. ASTM - American Society of Testing Materials
  7. AWSC - American Welding Society Code
  8. ANSI - American National Standards Institute
  9. CBC - California Building Code
  10. CCR - California Code of Regulations
  11. CEC - California Electrical Code
  12. CFC - California Fire Codes
  13. CMC - California Mechanical Code
  14. CPC - California Plumbing Code
  15. FIA - Factory Insurance Association
  16. NAFM - National Association of Fan Manufacturers
  17. NEMA - National Electrical Manufacturer's Association
  18. NFPA - National Fire Protection Association
  19. ORS - Office of Regulatory Services
  20. SCAQMD - South Coast Air Quality Management District
  21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
  22. UFC - Uniform Fire Code
  23. UL - Underwriter's Laboratories
  24. UPC - Uniform Plumbing Code
- B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.
- C. Codes and Standards:
1. UBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
  2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
  3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
  4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
  5. National Fire Protection Associations - National Fire Code.
- D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.
- E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

#### **1.07 PERMITS, FEES AND INSPECTIONS**

- A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

#### **1.08 DRAWINGS AND SPECIFICATIONS**

- A. The Architect's decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supercede the specification in the event of a conflict.



- E. Alternate support or seismic detail shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

#### **1.09 SUBMITTALS**

- A. Before starting work, the Contractor shall furnish for the approval of the Architect, Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.
- C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified
- D. Submittals shall include, but not necessarily be limited to the following which are mandatory:
  - 1. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
  - 2. Specialties, valves, gauges and thermometers of all types.
  - 3. Foundations, supports, hangers, inserts.
  - 4. Earthquake supports and calculations.
  - 5. Expansion loops, expansion joints, guides, and anchors.
  - 6. Insulation.
  - 7. Shop fabrication drawings and installation drawings of ductwork and piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping and ductwork to finish floor level.
  - 8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
  - 9. Automatic control system diagrams.
  - 10. Access panels.
  - 11. Clean-outs
  - 12. Fixture carriers.
  - 13. Hangers, inserts, supports, anchors.
  - 14. Hose bibs.
  - 15. Hot water circulators.
  - 16. Pipe, fittings and specialties.
  - 17. Pipe isolators.
  - 18. Plumbing fixtures, fittings, trim, drains and receptors.
  - 19. Pressure regulators.
  - 20. Roof flashing.
  - 21. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
  - 22. Strainers
  - 23. Water hammer arrestors.
  - 24. Water heating equipment.
  - 25. Expansion joints, guides and anchors.
  - 26. Shop fabrications drawings and calculations.
  - 27. Special and miscellaneous products furnished under this section and not listed herein.

#### **1.10 RECORD DRAWINGS AND MANUALS**

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 1 requirements.

- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.
- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
  - 1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
  - 2. Specifications
  - 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
  - 4. Grouting requirements.
  - 5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
  - 6. Start-up and beginning operation procedures.
  - 7. Operational procedures.
  - 8. Shutdown procedures.
  - 9. Maintenance and calibration procedures
  - 10. Parts lists
  - 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.
- I. "As-Built" drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

#### **1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP**

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

#### **1.12 SEISMIC DESIGN**

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
  - 1. In accordance with Title 24, 2010 CBC Chapter 16, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.

2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. "Deferred Approval" items will not be permitted unless specifically approved by the plan check supervisor.
  - a. Exception: Attachments of equipment weighting less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.
3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2010 CBC Chapter 16. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

### **1.13 SUBSTITUTIONS AND CHANGES**

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.
- E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

### **1.14 APPROVALS**

- A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

### **1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS**

- A. Immediately after award of the Contract and after the approval of submittals by the Architect, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time. He shall deliver to the Architect a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

### **1.16 LOCATIONS AND ACCESSIBILITY**

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as approved by Architect. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.
- C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors or any other indicating equipment or specialties requiring

reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.

- D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.
- E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.
- F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.
- G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

#### **1.17 COORDINATION OF TRADES**

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference between trades.
- C. Submit Composite Drawings in accordance with Special Conditions. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Drawings shall be specifically noted and identified on the Composite Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Drawings.
  - 1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
  - 2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
  - 3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
  - 4. Concrete: Conform to Concrete Section of the Specifications.

#### **1.18 GUARANTEES**

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
  - 1. Faulty or inadequate design of equipment or material installed
  - 2. Improper assembly or erection
  - 3. Defective workmanship or material
  - 4. Incorrect or inadequate operation or other failure
- C. He shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise
- D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period

- E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.
- F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty to the Owner, who shall be named as beneficiary.

#### **1.19 PROTECTION OF EQUIPMENT AND MATERIALS**

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

#### **1.20 CLOSING-IN OF UNINSPECTED WORK**

- A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

#### **1.21 BUILDING FOOTING CLEARANCES**

- A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

#### **1.22 DAMAGE BY LEAKS**

- A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

#### **1.23 EQUIPMENT LABELS**

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

#### **1.24 PRELIMINARY OPERATION**

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

#### **1.25 MAINTAINING EXISTING SERVICES**

- A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.
- B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Architect.
- C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.
- D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

## **1.26 ELECTRICAL WORK**

- A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.
- B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.
- D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 26.
- F. Control wiring shall be provided by Division 22, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 26.

**END OF SECTION**

**SECTION 22 05 53**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

**1.02 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Champion America, Inc: [www.Champion-America.com](http://www.Champion-America.com).
- C. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).

**2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.
  - 3. Background Color: Black.

**2.03 TAGS**

- A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

**2.04 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
  - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
  - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
  - 6. Ductwork and Equipment: 2-1/2 inch high letters.
- B. Stencils shall be identified as indicated below including direction of flow
  - 1. Refrigerant Suction Line - R.S.L.
  - 2. Refrigerant Liquid Line - R.L.L.
  - 3. Gravity Condensate - G.C.
  - 4. Domestic Cold Water - D.C.W.
  - 5. Domestic Hot Water - D.H.W.
  - 6. Domestic Hot Water Return - D.H.W.R.

- C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

## **2.05 PIPE MARKERS**

- A. Comply with ASME A13.1.
- B. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### **3.02 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- E. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify thermostats relating to terminal boxes or valves with nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify air terminal units and radiator valves with numbered tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**



**SECTION 22 10 05**  
**PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer and vent.
  - 2. Domestic water.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; The American Society of Mechanical Engineers; 2011.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2011.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2012.
- G. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.
- H. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- I. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- J. ASTM B32 - Standard Specification for Solder Metal; 2008.
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005 (Reapproved 2011).
- M. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).
- N. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2012.
- O. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.
- P. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- Q. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; 2011.
- R. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- S. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.
- T. CISPI 301-09 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.

- U. CISPI 310-10 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011.
- V. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- W. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- X. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- Y. ASME - Boiler and Pressure Vessel Code
- Z. AGA - American Gas Association Code

### **1.03 SUBMITTALS**

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

### **1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of California, standards.
  - 1. Maintain one copy on project site.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

### **1.05 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with State of California plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **PART 2 PRODUCTS**

### **2.01 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A).
  - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.32, solvent.
  - 2. Joints: ASTM B32, alloy Sn50 solder.

### **2.02 WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

### **2.03 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 Inches and Under:
  1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Grooved and Shouldered Pipe End Couplings:
  1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
  2. Sealing gasket: "C" shape composition sealing gasket.

### **2.04 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  1. Conform to ASME B31.9.
  2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- C. Plumbing Piping - Water:
  1. Conform to ASME B31.9.
  2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

### **2.05 BALL VALVES**

- A. Manufacturers:
  1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
  2. Apollo Valves: [www.apollovalves.com](http://www.apollovalves.com).
  3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Stockham: [www.stockham.com](http://www.stockham.com)
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.
- C. Construction, 4 Inches and Smaller: MSS SP-110, \_\_\_\_\_ psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide access where valves and fittings are not exposed.
- H. Install valves with stems upright or horizontal, not inverted.
- I. Install water piping to ASME B31.9.
- J. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

### **3.04 APPLICATION**

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install globe valves for throttling, bypass, or manual flow control services.
- C. Provide spring loaded check valves on discharge of water pumps.

### **3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 33 13 00.
- B. Prior to starting work, verify system is complete, flushed and clean.

### **3.06 SERVICE CONNECTIONS**

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
- C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

### **3.07 SCHEDULES - SEE SHEET P-4.1 FOR PIPE SUPPORT SCHEDULE**

**END OF SECTION**

**SECTION 22 10 06**  
**PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Roof and floor drains.
- B. Water hammer arrestors.

**1.02 REFERENCE STANDARDS**

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
- B. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).
- C. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2009 (ANSI/ASSE 1012).
- D. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2011.
- E. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2011 (ANSI/ASSE 1019).
- F. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2010.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Certificates: Certify that oil interceptors meet or exceed specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS**

**2.01 DRAINS**

- A. Manufacturers:
  - 1. Josam Company: [www.josam.com](http://www.josam.com).
  - 2. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 4. Mifab: [www.mifab.com](http://www.mifab.com)
- B. Floor Drain:
  - 1. ASME A112.6.3; galvanized cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- C. Floor Sink:
  - 1. Cast iron 8 inch square, 6 inch deep flanged receptor with seepage holes, acid resistant coated interior, loose set acid resistant coated cast iron grate, and aluminum dome bottom strainer.

**2.02 CLEANOUTS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Josam Company: [www.josam.com](http://www.josam.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).

4. Mifab: [www.mifab.com](http://www.mifab.com)

### **2.03 HOSE BIBBS**

- A. Manufacturers:
  1. Woodford: [www.woodfordmfg.com](http://www.woodfordmfg.com).
  2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  3. Mifab: [www.mifab.com](http://www.mifab.com)

### **2.04 HYDRANTS**

- A. Wall Hydrants:
  1. ASSE 1019; freeze resistant, self-draining type with chrome plated lockable recessed box hose thread spout, handwheel, and integral vacuum breaker.

### **2.05 WATER HAMMER ARRESTORS**

- A. Manufacturers:
  1. Precision Plumbing Products: [www.pppinc.com](http://www.pppinc.com).
  2. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  4. Mifab: [www.mifab.com](http://www.mifab.com)

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- E. Pipe relief from backflow preventer to nearest drain.

**END OF SECTION**

**SECTION 22 30 00**  
**PLUMBING EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water heaters.
- B. Pumps.
  - 1. Circulators.
  - 2. Sump Pumps.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2011.
- B. ANSI Z21.10.3 - Gas Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters; 2011.
- C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- D. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

**1.05 CERTIFICATIONS**

- A. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 WATER HEATER MANUFACTURERS**

- A. A.O. Smith Water Products Co: [www.hotwater.com](http://www.hotwater.com).

**2.02 COMMERCIAL ELECTRIC WATER HEATERS**

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Performance:
- C. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

- D. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- E. Accessories: Provide:
- F. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gages.
- G. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

### **2.03 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:
  - 1. Armstrong Pumps Inc: [www.armstrongpumps.com](http://www.armstrongpumps.com).
  - 2. ITT Bell & Gossett: [www.bellgossett.com](http://www.bellgossett.com).
  - 3. Taco Pumps: [www.taco-hvac.com](http://www.taco-hvac.com).
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Pumps:
  - 1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

### **3.02 SCHEDULES - SEE SHEET P-0.1**

**END OF SECTION**



**SECTION 22 40 00**  
**PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.
- G. Drinking fountains.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- D. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2011.
- E. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).
- F. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2013.
- G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.
- H. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

**1.03 SUBMITTALS**

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Manufacturer's Instructions: Indicate installation methods and procedures.
- C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.05 REGULATORY REQUIREMENTS**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

## **PART 2 PRODUCTS**

### **2.01 FLUSH VALVE WATER CLOSETS**

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 1. Flush Volume: 1.28 gallon, maximum.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Manual, oscillating handle.
  - 4. Handle Height: 44 inches or less.
  - 5. Manufacturers:
    - a. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
    - b. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
    - c. Kohler Company: [www.kohler.com](http://www.kohler.com).
    - d. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
- C. Seats:
  - 1. Manufacturers:
    - a. Olsonite: [www.olsonite.com](http://www.olsonite.com).
    - b. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

### **2.02 WALL HUNG URINALS**

- A. Wall Hung Urinal Manufacturers:
  - 1. Zurn Industries, Inc; EcoVantage Zurn Z5799: [www.zurn.com](http://www.zurn.com).
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
  - 1. Flush Volume: 0.125 gallon, maximum.
  - 2. Flush Style: Washout.
  - 3. Flush Valve: Exposed (top spud).
  - 4. Flush Operation: Sensor operated.
  - 5. Trap: Integral.
  - 6. Removable stainless steel strainer.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
  - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

### **2.03 LAVATORIES**

- A. Lavatory Manufacturers:
  - 1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  - 2. Kohler Company: [www.kohler.com](http://www.kohler.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
- B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, \_\_\_ by \_\_\_ inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.
- C. Steel Counter Top Basin:

1. ASME A112.19.4M; porcelain on steel self-rimming counter top lavatory, with drillings on 4 inch centers, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.
- D. Vitreous China Counter Top Basin:
  1. ASME A112.19.2; vitreous china self-rimming counter top lavatory, 20 1/4 x 17 1/2 inches with drillings on 4 inch centers, front overflow, seal of putty, calking, or concealed vinyl gasket.
- E. Supply Faucet Manufacturers:
  1. Chicago Faucets, a Geberit company: [www.chicagofaucets.com](http://www.chicagofaucets.com).
  2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
- F. Supply Faucet:
 

ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum 0.5 gpm flow, indexed handles.

  1. ASME A112.18.1; chrome plated metered mixing faucet with low voltage operated solenoid operator and infrared sensor, 0.5 gpm aerator and cover plate, open grid strainer.

## 2.04 SINKS

- A. Sink Manufacturers:
  1. American Standard, Inc: [www.americanstandard-us.com](http://www.americanstandard-us.com).
  2. Kohler Company: [www.kohler.com](http://www.kohler.com).
- B. Single Compartment Bowl:
  1. ASME A112.19.3; 25 x 22 x 7 11/16 in outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
    - a. Drain: 1-1/2 inch chromed brass drain.
- C. Double Compartment Bowl:
  1. ASME A112.19.3; 33 x 22 x 8 3/16 inch outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
    - a. Drain: 1-1/2 inch chromed brass drain.
- D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

## 2.05 ELECTRIC WATER COOLERS

- A. Electric Water Cooler Manufacturers:
  1. Elkay Manufacturing Company: [www.elkay.com](http://www.elkay.com).
  2. Haws Corporation: [www.hawsco.com](http://www.hawsco.com).
  3. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
  4. Capacity: 8 gallons per minute of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
  5. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

## 2.06 SERVICE SINKS

- A. Service Sink Manufacturers:
  1. American Standard, Inc: [www.americanstandard-us.com](http://www.americanstandard-us.com).
- B. Bowl: ASME A112.19.1M; 22 by 18 by 12 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.
- C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

- D. Accessories:
  - 1. Hose clamp hanger.
  - 2. Mop hanger.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

#### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

#### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key or integral stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

#### **3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

#### **3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

#### **3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

#### **3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

#### **3.08 SCHEDULES**

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches to top of bowl rim.
    - b. Accessible: 18 inches to top of seat.
  - 2. Water Closet Flush Valves:
    - a. Standard: 11 inches min. above bowl rim.
    - b. Recessed: 10 inches min. above bowl rim.
  - 3. Urinal:
    - a. Standard: 22 inches to top of bowl rim.
    - b. Accessible: 17 inches to top of bowl rim.
  - 4. Lavatory:
    - a. Standard: 31 inches to top of basin rim.
    - b. Accessible: 34 inches to top of basin rim.
  - 5. Shower Heads:

- a. Adult Male: 69.5 inches to bottom of head.
  - b. Adult Female: 64.5 inches to bottom of head.
- B. Fixture Rough-In - See sheet P-0.1

**END OF SECTION**



**SECTION 22 60 05**  
**MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Medical oxygen gas system.
- B. Medical compressed air system.
- C. Medical vacuum system.

**1.02 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2013.
- D. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- E. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- F. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- G. ASTM B819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems; 2000 (Reapproved 2011).
- H. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- J. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2013.
- K. MSS SP-88 - Diaphragm Type Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.
- N. NFPA 55 - Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks; National Fire Protection Association; 2013.
- O. NFPA 99 - Health Care Facilities Code; National Fire Protection Association; 2012.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.
- C. Shop Drawings: Indicate general assembly of components, mounting and installation details, and general layout of control and alarm panels. Submit detailed medical wall assembly drawings.
- D. Independent Testing Agency Reports: Indicate systems are complete, zone valves installed, alarm systems functional, and pressure and cross connections tests performed. Document tests.

- E. Manufacturer's Instructions: Indicate installation requirements for equipment and systems.
- F. Manufacturer's Field Reports: Indicate systems are complete, zone valves installed, and alarm systems functional.
- G. Operation Data: Include installation instructions, assembly views, lubrication instructions, and assembly views.
- H. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with NFPA 99.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.
- D. Testing Laboratory: Company specializing in performing testing of the type specified in this section, with minimum 3 years of documented experience.
- E. Conform to applicable code for medical gas systems.
- F. Provide certificate of compliance from authority having jurisdiction, indicating approval of systems.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept material on site in factory containers and packing. Inspect for damage.
- B. Protect from damage and contamination by maintaining factory packaging and caps in place until installation.

#### **1.06 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for \_\_\_\_\_.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
- B. BeaconMedaes; \_\_\_\_\_: [www.beaconmedical.com](http://www.beaconmedical.com).

#### **2.02 PIPE AND FITTINGS**

- A. Factory Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.
- B. Oxygen, Compressed Air, Nitrous Oxide, Nitrogen Systems, Aboveground:
  - 1. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn.
  - 2. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
  - 3. Joints: AWS A5.8M/A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- C. Vacuum and Anesthesia Gas Evacuation Systems, Aboveground:
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
  - 2. Joints: AWS A5.8M/A5.8 Classification BCuP-3 or BCuP-4 silver braze or ASTM B32, solder, Grade Sn95.



### **2.03 VALVES**

- A. Factory Preparation for Oxygen Service: Disassemble, clean, degrease, seal, and pack for shipping.
- B. Ball Valves:
  - 1. Requirements: Comply with MSS SP-110; bronze body, three piece, double-seal ball valves with replaceable neoprene or teflon seat and stem seals, for minimum 600 psi cold working pressure, flange or union mounting, labeled for intended service.

### **2.04 PIPING ACCESSORIES**

- A. Hangers and Supports: MSS SP-58 with types as required.
- B. Valve Cabinets:
  - 1. Extruded aluminum, flush-mounted and rigidly assembled to accommodate valves and fittings, punched or drilled sides to receive tubing, anchors to secure to wall construction.
  - 2. Cover Plates: Extruded aluminum, with replaceable plastic windows with pull ring to remove window.
  - 3. Cabinet Labels: labeled and color coded for intended service and area served.
  - 4. Valves: Pre-assemble and mount chrome plated valves and tubing extensions.
  - 5. Gages: Provide where indicated and in operating rooms areas downstream of isolating valves.
- C. Piping Identification: Pressure sensitive adhesive tape and decals, color and labeling to conform with Section 22 05 53.

### **2.05 OUTLETS**

- A. Outlet Units:
  - 1. Manufacturers:
    - a. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
    - b. BeaconMedaes; \_\_\_\_\_: [www.beaconmedical.com](http://www.beaconmedical.com).
  - 2. NFPA 99 non-interchangeable connectors, automatic valves, secondary check valves (except vacuum and evacuation outlets), and capped 3/8 inch tubing stubs for supply connections, color coded and labeled for intended service.
- B. Faceplates:
  - 1. Flush Outlets: Mount in galvanized steel boxes with chrome-plated faceplate with Lexan cover, color coded with embossed labeling.
  - 2. Surface Outlets: Surface mount with color coded plastic cover and chrome-plated faceplate with Lexan cover, color coded with embossed labeling.

### **2.06 MEDICAL COMPRESSED AIR SYSTEM**

- A. Manufacturers:
  - 1. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
  - 2. BeaconMedaes; \_\_\_\_\_: [www.beaconmedaes.com](http://www.beaconmedaes.com).
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.07 MEDICAL VACUUM SYSTEM**

- A. Manufacturers:
  - 1. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
  - 2. BeaconMedaes; \_\_\_\_\_: [www.beaconmedaes.com](http://www.beaconmedaes.com).
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.08 OXYGEN MANIFOLD**

- A. Manufacturers:
  - 1. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
  - 2. BeaconMedaes; \_\_\_\_\_: [www.beaconmedical.com](http://www.beaconmedical.com).

- B. Duplex Automatic Manifold: Consisting of wall mounted control cabinet and necessary header connections and pigtails for 8 cylinders, arranged for 4 cylinders in service and 4 cylinders in reserve.
- C. Delivery: Maximum 220 cfm oxygen continuously at 50 psi. Provide automatic changeover from primary to secondary bank and allow replacing depleted cylinders with no change in line pressure.
- D. Cabinet: House components in lockable cabinet with baked enamel finish.
  - 1. Three front mounted gages: Indicate bank and hospital line pressures.
  - 2. Green indicator light: Indicate service bank in use.
  - 3. Red indicator light: Indicate reserve bank in use.
  - 4. Terminal block: Connections for remote alarms.

## **2.09 ALARM SYSTEM**

- A. Manufacturers:
  - 1. Allied Healthcare Products, Inc; \_\_\_\_\_: [www.alliedhpi.com](http://www.alliedhpi.com).
  - 2. BeaconMedaes; \_\_\_\_\_: [www.beaconmedical.com](http://www.beaconmedical.com).
- B. High-Low Pressure Alarm Panels: Closed circuit, self-monitoring type, to monitor oxygen, vacuum, compressed air, nitrous oxide, and nitrogen.
  - 1. Green light for systems normal.
  - 2. High or low pressure warning:
    - a. Green light extinguishes.
    - b. Audible warning device sounds.
    - c. Red light energizes.
  - 3. Gage indicates pressure or vacuum.
  - 4. Switch silences warning device.
  - 5. Test switch to test light bulbs and audible warning device.
  - 6. Provide system with internal switches, gages, control unit, and transformer.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with NFPA 99.
- B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal of water. After washing, rinse with water, dry and cap until installation.
- C. Braze joints in pipe and tubing. Avoid leaving excess flux inside of pipe and fittings. During brazing of pipe connections, purge interior of pipe continuously with nitrogen.
- D. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Make bends free of flattening, buckling or thinning of tube wall.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Grade piping down in direction of flow.
- G. Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Finish flush at both ends. Extend 2 inches above finished floors. Pack space between pipe or tubing and sleeve, and calk.
- H. Identify piping with tape and decals. Provide piping identification code and schematic for installation under provisions of Section 22 05 53. Install labeling on pipe at intervals of not more than 20 feet and at least once in each room and each story traversed by pipeline.
- I. Support gas piping with pipe hooks or hangers suitable for size of pipe, spaced:
  - 1. 1/2 inch pipe or tubing: 72 inches.
  - 2. 3/4 inch or one inch pipe or tubing: 96 inches.
  - 3. 1-1/4 inches or larger (horizontal): 120 inches.

- 4. 1-1/4 inches or larger (vertical): Every floor level.
- J. Except where indicated or in flush wall mounted cabinets, install manual shut off valves with stem vertical and accessible for operation and maintenance.

### **3.02 PIPING SYSTEMS CLEANING AND PRESSURE TESTING**

- A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter with nitrogen gas.
- B. Install service outlet valves, subject system to test pressure of 150 psi with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

### **3.03 FIELD QUALITY CONTROL**

- A. Independent testing agency to certify system is complete, zone valves installed, alarm systems functional, and tests performed. Document tests and submit.
- B. Reduce pressure in piping systems other than system under investigation to atmospheric.
- C. Test system with dry compressed air or dry nitrogen with test pressure in piping system at 50 psi.
- D. Check each station outlet of every piping system to determine test gas is dispensed only from outlet of system under investigation. Measure pressure with gage attached to specific adaptor. Do not use universal adaptors.
- E. Disconnect test gas and connect proper gas to each system. Purge entire system to remove test gas. Check with analyzer suitable for gas installed.

**END OF SECTION**



**SECTION 23 00 10**  
**BASIC MECHANICAL REQUIREMENTS**

**PART 1. GENERAL**

**1.01 SECTION INCLUDES**

- A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 01 - General Requirements.

**1.02 DESCRIPTION**

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

**1.03 WORK INCLUDED**

- A. The complete Heating, Ventilating and Air Conditioning (HVAC) systems, including but not limited to these major items.
  - 1. Coordinate work of this Section with related trades.
  - 2. Verify applicable dimensions at the jobsite.
  - 3. Duct systems; supply, return and exhaust complete with fire dampers, combination fire-smoke dampers, and manual dampers.
  - 4. Diffusers and registers.
  - 5. Exhaust supply, return fans and air curtains.
  - 6. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
  - 7. Duct lining and insulation.
  - 8. Installation and connection of Owner furnished equipment.
  - 9. Water heating systems, including water heating equipment, circulating pumps, connections.
  - 10. Shop drawings.
  - 11. Equipment identification.
  - 12. Equipment and systems adjustments and balancing.
  - 13. Air, water and gas systems testing, adjusting and balancing.
  - 14. Written operating and maintenance instructions.
  - 15. Record drawings.
  - 16. Guarantee

**1.04 WORK SPECIFIED ELSEWHERE**

- A. Concrete, Architectural Sheet Metal, Door and Exterior Wall Louvers, Painting and Electrical.

**1.05 SITE INSPECTION**

- A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

**1.06 ORDINANCES, REGULATIONS AND CODES**

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.
  - 1. AFI - Air Filter Institute
  - 2. AMCA - Air Moving & Conditioning Association
  - 3. ARI - Air Conditioning & Refrigeration Institute
  - 4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
  - 5. ASME - American Society of Mechanical Engineers
  - 6. ASTM - American Society of Testing Materials
  - 7. AWS - American Welding Society Code
  - 8. ANSI - American National Standards Institute

9. CBC - California Building Code
  10. CCR - California Code of Regulations
  11. CEC - California Electrical Code
  12. CFC - California Fire Codes
  13. CMC - California Mechanical Code
  14. CPC - California Plumbing Code
  15. FIA - Factory Insurance Association
  16. NAFM - National Association of Fan Manufacturers
  17. NEMA - National Electrical Manufacturer's Association
  18. NFPA - National Fire Protection Association
  19. ORS - Office of Regulatory Services
  20. SCAQMD - South Coast Air Quality Management District
  21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
  22. UFC - Uniform Fire Code
  23. UL - Underwriter's Laboratories
  24. UPC - Uniform Plumbing Code
- B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.
- C. Codes and Standards:
1. UBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
  2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
  3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
  4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
  5. National Fire Protection Associations - National Fire Code.
- D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.
- E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

#### **1.07 PERMITS, FEES AND INSPECTIONS**

- A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

#### **1.08 DRAWINGS AND SPECIFICATIONS**

- A. The Architect's decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supercede the specification in the event of a conflict.
- E. Alternate support or seismic detail shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

## **1.09 SUBMITTALS**

- A. Before starting work, the Contractor shall furnish for the approval of the Architect, Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.
- C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified
- D. Submittals shall include, but not necessarily be limited to the following which are mandatory:
  - 1. Draw Equipment Layouts to ¼" scale, including equipment, piping accessories, and showing clearances for operating and servicing.
  - 2. Pumps, pump characteristic curves.
  - 3. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
  - 4. Specialties, valves, gauges and thermometers of all types.
  - 5. Foundations, supports, hangers, inserts.
  - 6. Earthquake supports and calculations.
  - 7. Expansion loops, expansion joints, guides, and anchors.
  - 8. Insulation.
  - 9. Ventilation and air conditioning equipment, specialties and the air control systems.
  - 10. Fans, fan characteristic curves, fan tests.
  - 11. Dampers, louvers, grilles, registers, diffusers.
  - 12. Shop fabrication drawings and installation drawings of ductwork and piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping and ductwork to finish floor level.
  - 13. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
  - 14. Automatic control system diagrams.
  - 15. Underground and above ground tanks, accessories.
  - 16. Exhaust, supply and return fans.
  - 17. Access panels.
  - 18. Hangers, inserts, supports, anchors.
  - 19. Pipe, fittings and specialties.
  - 20. Pipe isolators.
  - 21. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
  - 22. Expansion joints, guides and anchors.
  - 23. Shop fabrications drawings and calculations.
  - 24. Special and miscellaneous products furnished under this section and not listed herein.

## **1.10 RECORD DRAWINGS AND MANUALS**

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 01 requirements.
- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
  - 1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
  - 2. Specifications
  - 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
  - 4. Grouting requirements.
  - 5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
  - 6. Start-up and beginning operation procedures.
  - 7. Operational procedures.
  - 8. Shutdown procedures.
  - 9. Maintenance and calibration procedures
  - 10. Parts lists
  - 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.
- I. "As-Built" drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

#### **1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP**

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

#### **1.12 SEISMIC DESIGN**

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
  - 1. In accordance with Title 24, 2010 CBC Chapter 16, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
  - 2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. "Deferred Approval" items will not be permitted unless specifically approved by the plan check supervisor.



- a. Exception: Attachments of equipment weighting less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.
3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2010 CBC Chapter 16. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

### **1.13 SUBSTITUTIONS AND CHANGES**

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.
- E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

### **1.14 APPROVALS**

- A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

### **1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS**

- A. Immediately after award of the Contract and after the approval of submittals by the Architect, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time. He shall deliver to the Architect a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

### **1.16 LOCATIONS AND ACCESSIBILITY**

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as approved by Architect. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.
- C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.
- D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

- E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.
- F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.
- G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

#### **1.17 COORDINATION OF TRADES**

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference between trades.
- C. Submit Composite Drawings in accordance with Special Conditions. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Drawings shall be specifically noted and identified on the Composite Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Drawings.
  - 1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
  - 2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
  - 3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
  - 4. Concrete: Conform to Concrete Section of the Specifications.

#### **1.18 GUARANTEES**

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
  - 1. Faulty or inadequate design of equipment or material installed
  - 2. Improper assembly or erection
  - 3. Defective workmanship or material
  - 4. Incorrect or inadequate operation or other failure
- C. He shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise
- D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period
- E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.
- F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty to the Owner, who shall be named as beneficiary.

### **1.19 PROTECTION OF EQUIPMENT AND MATERIALS**

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

### **1.20 CLOSING-IN OF UNINSPECTED WORK**

- A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

### **1.21 BUILDING FOOTING CLEARANCES**

- A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

### **1.22 DAMAGE BY LEAKS**

- A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

### **1.23 EQUIPMENT LABELS**

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

### **1.24 PRELIMINARY OPERATION**

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

### **1.25 MAINTAINING EXISTING SERVICES**

- A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.
- B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Architect.
- C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.
- D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

### **1.26 ELECTRICAL WORK**

- A. Coordinate with Division 16 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

- B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.
- D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 26.
- F. Control wiring shall be provided by Division 23, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 26.

**END OF SECTION**

**SECTION 23 05 93**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.
- C. Commissioning activities.

**1.02 REFERENCE STANDARDS**

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

**1.03 SUBMITTALS**

- A. The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems. The independent agency shall be certified and in good standing with the AABC.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Architect.
  - 2. Submit to the Commissioning Authority.
  - 3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
  - 4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with Architect and other installers to sufficiently understand the design intent for each system.
  - 5. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Identification and types of measurement instruments to be used and their most recent calibration date.
    - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - e. Final test report forms to be used.
    - f. Expected problems and solutions, etc.
    - g. Criteria for using air flow straighteners or relocating flow stations and sensors.
    - h. Details of how TOTAL flow will be determined; for example:
      - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
    - i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

- j. Confirmation of understanding of the outside air ventilation criteria under all conditions.
  - k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
  - l. Method of checking building static and exhaust fan and/or relief damper capacity.
  - m. Time schedule for deferred or seasonal TAB work, if specified.
  - n. False loading of systems to complete TAB work, if specified.
  - o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
  - p. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
  - q. Procedures for formal progress reports, including scope and frequency.
  - r. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least twice a week to Commissioning Authority.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
  - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 7. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.
    - e. Project location.
    - f. Project Architect.
    - g. Project Engineer.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC MN-1, AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
  - 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Certified by the following:
    - a. AABC, Associated Air Balance Council: [www.aabchq.com](http://www.aabchq.com); upon completion submit AABC National Performance Guaranty.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature 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. Fans are rotating correctly.
  - 7. Fire and volume dampers are in place and open.
  - 8. Air coil fins are 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 is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### **3.03 ADJUSTMENT TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### **3.04 RECORDING AND ADJUSTING**

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### **3.05 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- 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 extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. 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.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- I. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches negative static pressure in chemical storage rooms.
- K. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

### **3.06 COMMISSIONING**

- A. Perform prerequisites prior to starting commissioning activities.
- B. Fill out Prefunctional Checklists for:
  - 1. Air side systems.
- C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- D. Re-check a random sample equivalent to 25 percent of the final TAB report data as directed by Commissioning Authority.
  - 1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
  - 2. Use the same test instruments as used in the original TAB work.
  - 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
  - 4. For purposes of re-check, failure is defined as follows:
    - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    - c. Temperatures: Deviation of more than one degree F.
    - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.



5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- E. In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
  2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

### **3.07 SCOPE**

- A. Test, adjust, and balance the following:
1. Plumbing Pumps
  2. Forced Air Furnaces
  3. Packaged Roof Top Heating/Cooling Units
  4. Packaged Terminal Air Conditioning Units
  5. Computer Room Air Conditioning Units
  6. Fans

**END OF SECTION**



**SECTION 23 07 13**  
**DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- D. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2011.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.
- F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.
- H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- I. SMACNA (DCS) - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.06 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 2. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - 3. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' value: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Governing body regulation values or as listed on the drawings as more stringent then 'K' value above, insulation value shall be superceeded with said value
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

### **2.03 GLASS FIBER, RIGID**

- A. Manufacturer:
  - 1. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 2. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - 3. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. 'K' value: .16 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Governing body regulation values or as listed on the drawings as more stringent then 'K' value above, insulation value shall be superceeded with said value
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

### **2.04 JACKETS**

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
  - 1. Thickness: 0.016 inch sheet.

### **2.05 DUCT LINER**

- A. Manufacturers:
  - 1. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 2. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - 3. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.
  - 1. Apparent Thermal Conductivity: Maximum of .24 at 75 degrees F.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.

- B. Verify that surfaces are clean, foreign material removed, and dry.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
  - 1. Finish with tape and vapor barrier jacket.
  - 2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
- D. Insulated ducts conveying air above ambient temperature:
- E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- F. External Duct Insulation Application:
  - 1. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  - 2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
- G. Duct and Plenum Liner Application:
  - 1. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
  - 2. Seal and smooth joints. Seal and coat transverse joints.
  - 3. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

### **3.03 SCHEDULES - INSULATE DUCTS PER TITLE-24 REQUIREMENTS**

**END OF SECTION**



**SECTION 23 09 13**  
**INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air supply system.
- B. Thermostats.
- C. Automatic dampers.
- D. Damper operators.
- E. Time clocks.
- F. Miscellaneous accessories.

**1.02 REFERENCE STANDARDS**

- A. AMCA 500-D - Laboratory Methods for Testing Dampers for Rating; Air Movement and Control Association International, Inc.; 2012.
- B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; National Electrical Manufacturers Association; 2008.

**1.03 SUBMITTALS**

- A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- C. Manufacturer's Instructions: Provide for all manufactured components.
- D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
- E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Automated Logic.
- B. Other Acceptable Manufacturers:
  - 1. BAC.
  - 2. LonWorks.
  - 3. eMAC: [emac.maxpg.com](http://emac.maxpg.com).

**2.02 EQUIPMENT - GENERAL**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**2.03 CONTROL PANELS**

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.

**2.04 DAMPERS**

- A. Performance: Test in accordance with AMCA 500-D.
- B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage.

- C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws.
- D. Jamb Seals: Spring stainless steel.
- E. Leakage: Less than one percent based on approach velocity of 2000 ft/min and 4 inches wg.

## **2.05 DAMPER OPERATORS**

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
  - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
  - 2. Provide one operator for maximum 36 sq ft damper section.
- B. Inlet Vane Operators:
  - 1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.
  - 2. Product:

## **2.06 INPUT/OUTPUT SENSORS**

- A. Temperature Sensors
- B. Static Pressure Sensors
- C. Equipment Operation Sensors:
  - 1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
- D. Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 - 100 percent damper travel.
- E. Carbon Monoxide Detectors:
  - 1. Single or multichannel dual level detectors, using solid state sensors with three year minimum life. Sensor replacement shall take maximum 15 minutes. Suitable over temperature range of 23 to 130 degrees F.

## **2.07 THERMOSTATS**

- A. Electric Room Thermostats:
  - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
  - 2. Service: cooling and heating.
  - 3. Covers: Locking with set point adjustment, with thermometer.
- B. Room Thermostat Accessories:
  - 1. Insulating Bases: For thermostats located on exterior walls.
  - 2. Aspirating Boxes: Where indicated for thermostats requiring flush installation.
- C. Airstream Thermostats:
  - 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.

## **2.08 TIME CLOCKS**

- A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.

## **2.09 TRANSMITTERS**

- A. Building Static Pressure Transmitter:
  - 1. One pipe, direct acting, double bell, scale range 0.01 to 6.0 inch wg positive or negative, and sensitivity of 0.0005 inch wg. Transmit electronic signal to receiver with matching scale range.



## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that systems are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.
- C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- E. Ensure installation of components is complementary to installation of similar components.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches. Refer to Section 26 27 26.
- C. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.
- D. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- E. Provide conduit and electrical wiring in accordance with Section 26 27 17. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

**END OF SECTION**



**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Duct cleaning.

**1.02 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.
- D. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- E. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.
- F. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2003.
- G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 PERFORMANCE REQUIREMENTS**

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

**1.04 SUBMITTALS**

- A. Product Data: Provide data for duct materials, duct liner, and duct connections.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

**1.05 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A standards.

**1.06 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

**PART 2 PRODUCTS**

**2.01 DUCT ASSEMBLIES**

**2.02 MATERIALS**

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Flexible Ducts:
  - 1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
    - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.

- b. Maximum Velocity: 4000 fpm.
  - c. Temperature Range: -20 degrees F to 210 degrees F.
- C. Insulated Flexible Ducts:
- 1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
    - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
    - b. Maximum Velocity: 4000 fpm.
    - c. Temperature Range: -20 degrees F to 210 degrees F.
- D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
- E. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

### **2.03 DUCTWORK FABRICATION**

- A. Fabricate ductwork gauge in accordance with current (CMC) California Mechanical Code and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. T's, bends, and elbows: Construct according to (CMC) California Mechanical Code and SMACNA (DCS).
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.
- F. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### **2.04 DUCT MANUFACTURERS**

- A. Metal-Fab, Inc: [www.mtlfab.com](http://www.mtlfab.com).
- B. SEMCO Incorporated: [www.semcoinc.com](http://www.semcoinc.com).
- C. United McGill Corporation: [www.unitedmcgill.com](http://www.unitedmcgill.com).

### **2.05 MANUFACTURED DUCTWORK AND FITTINGS**

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Grease Exhaust: Nominal 3 inches thick ceramic fiber insulation between 20 gage, 304 stainless steel liner and 24 gage, aluminized steel outer jacket.
  - 1. Tested and UL listed for use with commercial cooking equipment in accordance with NFPA 96.
  - 2. Certified for zero clearance to combustible material in accordance with:
  - 3. Materials and construction of the modular sections and accessories to be in accordance with the terms of the following listings:
  - 4. Manufacturers:

### **2.06 CASINGS**

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- C. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- D. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
- E. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.
- B. Install in accordance with manufacturer's instructions.
- C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- H. Use double nuts and lock washers on threaded rod supports.
- I. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low pressure ducts with 7 feet maximum length of flexible duct held in place with strap or clamp.
- K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

### **3.02 CLEANING**

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

### **3.03 SCHEDULES**

- A. Ductwork Material:
  1. Low Pressure Supply (Heating Systems): Steel, Aluminum, Fibrous Glass.
  2. Low Pressure Supply (System with Cooling Coils): Steel, Aluminum, Fibrous Glass.
  3. Return and Relief: Steel, Aluminum.

4. General Exhaust: Steel, Aluminum.
5. Kitchen Hood Exhaust: Steel, Stainless Steel.
6. Outside Air Intake: Steel.
7. Combustion Air: Steel.
8. Evaporative Condenser Intake and Exhaust: Steel.
9. Emergency Generation Ventilation: Steel.

B. Ductwork Pressure Class:

1. Supply (Heating Systems): 1/2 inch
2. Supply (System with Cooling Coils): 1/2 inch.
3. Return and Relief: 1/2 inch.
4. Outside Air Intake: 1/2 inch.
5. Combustion Air: 1/2 inch.
6. Emergency Generation Ventilation: 1/2 inch

**END OF SECTION**

**SECTION 23 33 00**  
**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Backdraft dampers.
- D. Combination fire and smoke dampers.
- E. Duct access doors.
- F. Duct test holes.
- G. Fire dampers.
- H. Flexible duct connections.
- I. Smoke dampers.
- J. Volume control dampers.

**1.02 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- B. NFPA 92 - Standard for Smoke-Control Systems; 2012.
- C. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

**1.04 QUALITY ASSURANCE**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS**

**2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Manufacturers:
  - 1. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
  - 2. PCI Industries, Inc; Pottorff Brand: [www.portorff.com](http://www.portorff.com).
  - 3. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
  - 4. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).
- B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with worm drive mechanism with removable key operator.

## **2.02 BACKDRAFT DAMPERS - METAL**

### **2.03 BACKDRAFT DAMPERS**

- A. Manufacturers:
  - 1. Louvers & Dampers, Inc: [www.louvers-dampers.com](http://www.louvers-dampers.com).
  - 2. Nailor Industries Inc: [www.nailor.com](http://www.nailor.com).
  - 3. PCI Industries, Inc; Pottorff Brand: [www.portorff.com](http://www.portorff.com).
  - 4. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

### **2.04 BACKDRAFT DAMPERS - FABRIC**

- A. Fabric Backdraft Dampers: Factory-fabricated, 18 gage, galvanized steel frame.
  - 1. Blades: Neoprene coated fabric material.
  - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
  - 3. Maximum Velocity: 1000 fpm (5 m/sec) face velocity.

### **2.05 COMBINATION FIRE AND SMOKE DAMPERS**

- A. Manufacturers:
  - 1. PCI Industries, Inc; Pottorff Brand: [www.portorff.com](http://www.portorff.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

### **2.06 DUCT ACCESS DOORS**

- A. Manufacturers:
  - 1. Nailor Industries Inc: [www.nailor.com](http://www.nailor.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
  - 3. SEMCO Incorporated: [www.semcoinc.com](http://www.semcoinc.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

### **2.07 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

### **2.08 FIRE DAMPERS**

- A. Manufacturers:
  - 1. PCI Industries, Inc; Pottorff Brand: [www.portorff.com](http://www.portorff.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
- D. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

### **2.09 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.



## **2.10 SMOKE DAMPERS**

- A. Manufacturers:
  - 1. PCI Industries, Inc; Pottorff Brand: [www.pottorff.com](http://www.pottorff.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- B. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

## **2.11 VOLUME CONTROL DAMPERS**

- A. Manufacturers:
  - 1. Louvers & Dampers, Inc: [www.louvers-dampers.com](http://www.louvers-dampers.com).
  - 2. Nailor Industries Inc: [www.nailor.com](http://www.nailor.com).
  - 3. PCI Industries, Inc; Pottorff Brand: [www.pottorff.com](http://www.pottorff.com).
  - 4. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and 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. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 22 05 48.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION**



**SECTION 23 37 00**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.
- C. Door grilles.
- D. Louvers.
- E. Goosenecks.

**1.02 REFERENCE STANDARDS**

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.
- B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.
- C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.
- D. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

**1.03 SUBMITTALS**

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

**1.04 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
- B. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).

**2.02 RECTANGULAR CEILING DIFFUSERS**

- A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.
- B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Aluminum with baked enamel off-white finish.

**2.03 CEILING SUPPLY REGISTERS/GRILLES**

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.
- B. Frame: 1 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Aluminum extrusions with factory off-white enamel finish.
- D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

**2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1 inch margin with countersunk screw mounting.

- C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

#### **2.05 DOOR GRILLES**

- A. Type: V-shaped louvers of 20 gage thick steel, 1 inch deep on 1/2 inch centers.
- B. Frame: 20 gage steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

#### **2.06 LOUVERS**

- A. Type: 4 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.
- B. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory prime coat finish color to be selected.
- C. Mounting: Furnish with interior flat flange for installation.

#### **2.07 GOOSENECKS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards of minimum 18 gage galvanized steel.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

#### **3.02 SCHEDULES SHOWN ON SHEET M-0.1**

**END OF SECTION**

**SECTION 26 00 10**  
**BASIC ELECTRICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SCOPE**

- A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the electrical specifications and drawings. Refer to all bid documents including Civil, Architectural, Structural, and Mechanical documents which may designate Work to be accomplished. The intent of the Specifications is to provide a complete and operable electrical system, which shall include all documents that are a part of the entire Project Contract.
  - 1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this division complete as shown or noted on the Drawings and specified herein.
- B. Related Work Specified Elsewhere:
  - 1. Refer to all sections in the general contract conditions, Contract Requirements and Division 1, General Requirements.
- C. Work Installed but Furnished by Others:
  - 1. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

**1.02 GENERAL REQUIREMENTS**

- A. Guarantee See General Conditions:
  - 1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guarantee period, from date of final completion. Guarantee all work against defective workmanship, material, and improper installation. Upon notification of failure, correct deficiency immediately and without additional cost to the Owner.
  - 2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Division 01.
- B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- C. Codes and Regulations:
  - 1. Design, manufacturer, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:
    - a. Institute of Electrical and Electronic Engineers - IEEE
    - b. National Electrical Manufacturers' Association - NEMA
    - c. Underwriters' Laboratories, Inc. - UL
    - d. National Fire Protection Association - NFPA
    - e. American Society for Testing and Materials - ASTM
    - f. American National Standards Institute - ANSI
    - g. California Electrical Code - CEC, Title 24, Part 3
    - h. California Code of Regulations, Title 8, Subchapter 5

- i. California Building Code-CBC, Title 24 Parts 1 &2
  - j. State & Municipal Codes in Force in the Specific Project Area
  - k. Occupational Safety & Health Administration - OSHA
  - l. California State Fire Marshal
  - m. California Fire Code- CFC, Title 24 Part 9
  - n. National Electrical Testing Association - NETA
2. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.
- D. Requirements of Regulatory Agencies:
- 1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply. The most stringent condition shall be as interpreted by the Engineer.
    - a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Contractor at his expense shall obtain the Work, unless otherwise specified.
    - b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.
- E. Shop Drawings:
- 1. See Division 01 for additional requirements.
  - 2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.
  - 3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.
  - 4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.
  - 5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. "It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces". Failure to add the above written statement for compliance will result in return of submittals without review.
    - a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" (275 mm x 435 mm) or smaller, in sets with covers neatly showing titles.
    - b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.
    - c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.
    - d. Include complete catalog information such as construction, ratings, insulation systems, as applicable.
    - e. For any material specified to meet UL or trade standards, furnish the manufacturers or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.
    - f. Reference listings to the specifications' Sections and Article to which each is applicable.
    - g. Equipment Floor Plans: After approval of material is secured prepare a floor plan of each electrical and communication equipment space, room or yard, drawn to scale at

- 1/2 inch equals 1 foot and submit for approval in the same manner as for shop drawings. The layout drawings shall be exact scale.
6. Contractor shall prepare coordinated drawings when required by Division 01 or where noted otherwise.
- F. Interpretations: The Contractor through the Architect must make Requests for interpretations of drawings and specifications. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.
- G. Standard of Quality
1. The contract Drawings and Specifications establish the "MINIMUM STANDARD OF QUALITY" each product and/or system must meet to be considered acceptable. Products of other manufacturers will be considered if the product and/or system meet or exceed the "MINIMUM STANDARD OF QUALITY" established by this Contract Document.
  2. Items for similar application shall be of the same manufacturer.
  3. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.
  4. Where codes as listed in Section General Requirement Section of the Specifications that establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.
  5. Provide the type and quantity of electrical materials and equipment necessary to complete Work and all systems in operation, tested and ready for use.
  6. Provide and install all incidental items that belong to the Work described and which are required for complete systems.
  7. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.
  8. All wiring devices such as switches and receptacles shall be of the same manufacturer.
- H. Substitutions: Refer to Division 01
- I. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:
1. General Requirements:
    - a. Panelboards.
    - b. Conduits
    - c. Conductors, include all selected insulation types.
    - d. Fuses
    - e. Disconnect switches and Starters.
    - f. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).
    - g. Control devices, standard and special receptacles, switches, outlets and finish device plates.
    - h. Cabinets for signal and telephone system, special terminals and cabinets. Include all cabinet dimensions.
    - i. Fire alarm system.
    - j. Transformers
- J. Utility Service:
1. Contractor shall verify the locations shown on the drawings and shall include extensions of lines to building service from locations which are acceptable to the Owner.
  2. Verify electrical, civil, architectural and structural, dimensional and other requirements with the Owner.
  3. Should any major modifications to the work indicated be necessary to comply with the Owner requirements, notify the Architect.
  4. Contractor shall contact the utility company representatives to establish pre-construction coordination, obtain all necessary meters and/or approvals, and schedule utility work to coordinate with the construction schedule.

5. All utility services shall be installed per the utility company requirements. Verify final construction requirements with utility company service planners prior to construction.
- K. Record Drawings: Refer to Division 01, Contract Closeout.
- L. Work Responsibilities:
1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, junction boxes and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of his work. Where conflicts occur in plans and/or specifications, the most stringent application shall apply and shall be part of the base bid.
  2. Locations shown on architectural plan or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect.
  3. In the event minor changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment or due to interference with other trades, such changes shall be made without extra cost.
  4. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.
  5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the furnished equipment will fit into the spaces provided without violation of applicable Codes.
  6. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect.
  7. Contractor shall be responsible for coordination of coordinated drawings when required by the Architect.
  8. Replace or repair, without additional compensation any work which does not comply with or which is installed in violation of any of these requirements.
- M. Installation General: For special requirements, refer to specific equipment under these requirements.
1. Unless otherwise specified elsewhere in the specifications, do all excavating necessary for the proper installation of the electrical work.
  2. Locations of Openings: Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Cutting or drilling in any structural member is prohibited without approval of the Architect. Furnish all access panels to make all boxes, connections and devices accessible as required by CEC.
  3. Location of Sleeves: Where conduits pass through concrete walls, suspended slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations.
  4. Wherever conduit extends through roof, install flashings in accordance with drawings and details.
  5. Contractor shall be responsible for cutting and patching which may be required for the proper installation of the electrical work.
  6. Protect work, materials and equipment and provide adequate and proper storage facilities during the progress of the work. Storage outdoors shall be weather protected and shall include space heaters to prevent condensation. Provide for the safety and good condition of all work until final acceptance of the work. Replace all damaged or defective work, materials and equipment before requesting final acceptance.
  7. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, spattered paint, cement and dirt on both exterior and interior. All underground conduits shall be mandrelled prior to pulling wire.



8. Conduit and Equipment to be Painted: Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.
  9. Items with Factory Finish: Remove cement, plaster, grease and oil, and leave surfaces, including cracks and corners, clean and polished. Touch up scratched or bare spots to match finish.
  10. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish on a weekly basis. Vacuum out all cabinets, switchgear and panels and junction boxes prior to pulling any conductors.
  11. Electrical equipment and materials exposed to public and in finished areas shall be finish-painted after installation in accordance with the Painting Section. All exposed screw-type fasteners, exterior, or interior in restrooms, shall be vandal-resistant spanner type; include tool.
- N. Excavation, Cutting and Patching:
1. Excavating, trenching and backfilling required for the work of this Division in accordance with the applicable requirements of Division 2. Excavating and backfilling connected with electrical work, repaving cuts and providing and maintaining protective measures for the electrical work excavation required by the governing authorities having jurisdiction shall be performed as a part of the work of this Division.
  2. Verify openings indicated on the drawings. Provide all cutting, patching and reinforcement of the construction of the building as required to install electrical work.
- O. Tests
1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.
  2. Resistance to ground tests shall be accomplished by a qualified independent testing firm to measure resistance to ground at grounding electrodes. Make tests before slabs or affected areas are poured in order that corrective measures, if required, may be taken. Submit a report showing the results of these measurements. If the resistances exceed values specified elsewhere or NETA test procedure recommendations, perform corrective measures required to reduce resistance to acceptable values.
  3. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.
  4. Measure the three-phase voltage at no load and at maximum load conditions and submit to the engineer a report showing the results of these measurements.
  5. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Owner's Representative. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.
  6. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.
  7. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.
- P. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.
- Q. Cleaning Up:

1. Upon completion of the work and at various time during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.
  2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.
  3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.
  4. Leave the entire installation in a clean condition.
- R. Completion:
1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
  2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.
- S. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. As specified in Division 01
- T. Inspection and Acceptance Procedures: The Architect will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.
- U. Final Completion of Electrical Systems:
1. Prior to Final Completion of operating electrical systems, the Contractor shall:
    - a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.
    - b. Furnish the required Operating and Maintenance Data/Manuals.
    - c. Clean up of the project pertaining to this Division of the work.
    - d. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Architect that systems are complete and operating in conformance with Contract Documents.
    - e. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.
    - f. Submission of warranties and guarantees.
  2. Final Completion of Work Shall be Contingent On:
    - a. Contractor replacing defective materials and workmanship.
    - b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as Architect directs. Conduct test in presence of authorized representative of Architect and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.
    - c. Contractor shall provide the necessary training programs and instructions to the Owner's representative. Number of hours shall be a minimum of four (4) hours for each system or days as required under separate Sections of these Specifications. Complete operation and maintenance manuals shall be provided at least two (2) weeks prior to training.
    - d. Submit copies of manufacturer's instructions and maintenance of electrical equipment including replacement parts lists. Each set shall include one set of shop drawings of equipment installed.
- V. Submittals for Change Orders: When changes are made during the construction phase, deletions and additions shall be presented in a manner that will indicate the cost of each item of

material and corresponding labor. Markup shall be then added in accordance with the requirements of the General Conditions as modified by the Supplementary Conditions.

- W. The Contractor at a time convenient to the Owner shall provide instruction to the Owner's operating personnel in the proper operation and maintenance of all equipment and systems. The instructors shall have received factory training and shall be thoroughly familiar with the equipment installed. The operating personnel shall receive the number of days instruction as indicated in other sections.

### **1.03 PROJECT RECORD DOCUMENTS**

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 01 requirements.
- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.
- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies, a complete separate, clean, undamaged set of the latest stamped, actioned submittals. As work progresses, maintain records of "as installed" conditions on this set in suitable ink or chemical fluid. Update the set daily. After successful completion of Project Site testing specified herein, and after completion of Punch List corrections, copy all records of "as installed" conditions on to originals.
- H. Quantity:
  - 1. Review sets:As for Shop and Field Drawings.
  - 2. Record set:Refer to Division 01.
- I. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition. Where room designations according to Project permanent signage differ from construction designations in the Contract Documents, show both designations.
- J. Warranty Certificates: Comply with Division 01.

### **PART 2 - PRODUCT**

#### **2.01 NOT USED**

### **PART 3 - INSTALLATION**

#### **3.01 NOT USED**

**END OF SECTION**



## SECTION 26 05 19

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wire and cable for 600 volts and less.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Wire pulling lubricant.

##### 1.02 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2012.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2008.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

##### 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

#### **2.02 CONDUCTOR AND CABLE MANUFACTURERS**

- A. Anaconda Power Cables
- B. Carol Cable
- C. Rome Wire and Cable
- D. Pirelli Wire and Cable
- E. Okonite Wire
- F. Canada Wire
- G. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
- H. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
- I. Southwire Company: [www.southwire.com](http://www.southwire.com).

#### **2.03 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

- H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- I. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
  - 2. Control Circuits: 14 AWG.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.
    - d. Isolated Ground, All Systems: Green with yellow stripe.
    - e. Travelers for 3-Way and 4-Way Switching: Pink.

#### **2.04 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.
    - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

- E. Type THWN for exterior or wet locations, in raceway.

## **2.05 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors or compression connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use split bolt mechanical connectors.
- C. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
  - 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
  - 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- G. Mechanical Connectors: Provide bolted type.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## **2.06 WIRING ACCESSORIES**

- A. Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
  - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
  - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
  - 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.



6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that raceway installation is complete and supported.
- E. Verify that field measurements are as shown on the drawings.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Include circuit lengths required to install connected devices within 10 ft of location shown.
  5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.
  8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:
    - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
    - b. Branch circuits with dimming controls.
    - c. Branch circuits with isolated grounding conductor.
    - d. Branch circuits feeding computer or IT loads.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Installation in Raceway:
  1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  - 3. Wet Locations: Use heat shrink tubing.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- N. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- O. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Keep splices in underground junction boxes, handholes, and manholes to an absolute minimum. Where splices are necessary, use resin pressure splices and resin splicing kits manufactured by the 3M Company to totally encapsulate the splice. Arrange the splicing kit to minimize the effects of moisture.

Q. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

**3.04 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.
- E. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

**END OF SECTION**



**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Grounding and bonding components.
- E. Provide all components necessary to complete the grounding system(s) consisting of:
  - 1. Metal underground water pipe.
  - 2. Metal frame of the building.
  - 3. Concrete-encased electrode.
  - 4. Rod electrodes.

**1.02 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Grounding System Resistance: 25 ohms.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide for grounding electrodes and connections.
- C. Project Record Documents: Record actual locations of components and grounding electrodes.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.02 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
  - 1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
  - 1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.

- 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

### **2.03 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
  2. Stranded Conductors: ASTM B 8.
  3. Tinned Conductors: ASTM B 33.
  4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  5. Bonding Conductor: No. 4 AWG, stranded conductor.
  6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Rod Electrodes: Copper-clad steel.

### **2.04 CONNECTORS AND ACCESSORIES**

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
1. Cadweld or approved equal.
- C. Wire: Stranded copper.
- D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.
- E. Grounding Well:
1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.
  2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

**END OF SECTION**

**SECTION 26 05 29**  
**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- D. MFMA-4 - Metal Framing Standards Publication; Metal Framing Manufacturers Association; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

**PART 2 PRODUCTS**

**2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 2. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
  - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of \_\_\_\_\_. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  - 1. Comply with MFMA-4.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

## **2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.
  - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Fabco Plastics Wholesale Limited.
    - d. Seasafe, Inc.
  - 3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
  - 4. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
  - 5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.



- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Hilti Inc.
      - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.

**END OF SECTION**



**SECTION 26 05 34**  
**CONDUIT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Intermediate metal conduit (IMC).
- D. PVC-coated galvanized steel rigid metal conduit (RMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Conduit fittings.
- J. Accessories.
- K. Conduit, fittings and conduit bodies.

**1.02 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
- D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; National Electrical Contractors Association; 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); National Electrical Contractors Association; 2003.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.
- K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2003.
- L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
- M. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- O. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- P. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

- Q. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- R. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- S. UL 651 - Schedule 40 and 80 Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- T. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- U. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

### **1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

### **1.04 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

## **PART 2 PRODUCTS**

### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  1. Under Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
  2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.

3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
  4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
  - E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
  - F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
  - G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
  - H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
  - I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
    1. Locations subject to physical damage include, but are not limited to:
      - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      - b. Where exposed below 20 feet in warehouse areas.
  - J. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
  - K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
  - L. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit or aluminum rigid metal conduit.
    1. Corrosive locations include, but are not limited to:
      - a. Cooling towers.
  - M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
  - N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
    1. Maximum Length: 6 feet.
  - O. Connections to Vibrating Equipment:
    1. Dry Locations: Use flexible metal conduit.
    2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
    3. Maximum Length: 6 feet unless otherwise indicated.
    4. Vibrating equipment includes, but is not limited to:
      - a. Transformers.
      - b. Motors.

## 2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4 inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.

3. Control Circuits: 1/2 inch (16 mm) trade size.
  4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
  5. Underground, Interior: 1 inch (27 mm) trade size.
  6. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### **2.04 ALUMINUM RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  3. Material: Use aluminum.
  4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### **2.05 INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  3. Material: Use steel or malleable iron.
  4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.
- C. All exposed conduit runs, fittings and supports in Building exteriors and interiors finished areas shall be painted to match the finish.
- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits in contact with concrete.

### **2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

- C. PVC-Coated Fittings:
  1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
  2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
  3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  4. Material: Use steel or malleable iron.
  5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

## **2.07 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.09 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use compression (gland) type.
    - a. Do not use indenter type connectors and couplings.
    - b. Do not use set-screw type connectors and couplings.
  4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
  5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

## **2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## **2.11 ACCESSORIES**

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  - 5. Unless otherwise approved, do not route conduits exposed:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.
    - d. Across building exterior surfaces.
  - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 9. Route conduits above water and drain piping where possible.
  - 10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  - 11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
  - 12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.



13. Group parallel conduits in the same area together on a common rack.
- I. Conduit Support:
    1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction.
    2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
    3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  - J. Connections and Terminations:
    1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
    2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
    3. Use suitable adapters where required to transition from one type of conduit to another.
    4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
    5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
    6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
    7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
    8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
  - K. Penetrations:
    1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
    2. Make penetrations perpendicular to surfaces unless otherwise indicated.
    3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
    4. Conceal bends for conduit risers emerging above ground.
    5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
    6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
    7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
    8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
    9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
  - L. Underground Installation:
    1. Provide trenching and backfilling None-N/A.
    2. Minimum Cover, Unless Otherwise Indicated or Required:
      - a. Underground, Exterior: 24 inches.
      - b. Under Slab on Grade: 12 inches to bottom of slab.
  - M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

- N. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  - 2. Where conduits are subject to earth movement by settlement or frost.
- P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  - 1. Where conduits pass from outdoors into conditioned interior spaces.
  - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
  - 3. Where conduits penetrate coolers or freezers.
- Q. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- R. Provide grounding and bonding.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

### **3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

### **3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
- B. Only where approved, route exposed conduit parallel and perpendicular to walls.
- C. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic and expansion joints and between building and walkway covers.

### **3.06 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

### **3.07 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in plans and specifications.
- B. Route conduit through roof openings for piping and ductwork wherever possible; otherwise, route through roof jack with pitch pocket. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

**END OF SECTION**

## SECTION 26 05 37

### BOXES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Wall and ceiling outlet boxes.
- D. Floor boxes.
- E. Pull and junction boxes.

##### 1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 1).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 2).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

##### 1.03 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

#### PART 2 PRODUCTS

##### 2.01 BOXES

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
  12. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

## 2.02 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  2. EGS/Appleton Electric.
  3. Erickson Electrical Equipment Company.
  4. Hoffman.
  5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
  6. O-Z/Gedney; a unit of General Signal.
  7. RACO; a Hubbell Company.
  8. Robroy Industries, Inc.; Enclosure Division.
  9. Scott Fetzer Co.; Adalet Division.
  10. Spring City Electrical Manufacturing Company.
  11. Thomas & Betts Corporation.
  12. Walker Systems, Inc.; Wiremold Company (The).
  13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

## 2.03 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
  2. Concrete Ceiling Boxes: Concrete type.

- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

#### **2.04 FLOOR BOXES**

- A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.
- B. Material: Cast metal.
- C. Shape: Round.

#### **2.05 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

#### **2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**

- A. Description: Comply with SCTE 77.
  - 1. Color of Frame and Cover: Gray.
  - 2. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - 3. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 4. Cover Legend: Molded lettering, as indicated for each service.
  - 5. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  - 6. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    - a. Jensen.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation.
    - d. Utility Vault.
    - e. Brooks.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

- E. Install boxes plumb and level.
- F. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- G. Install boxes as required to preserve insulation integrity.
- H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 26 05 26.
- M. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- N. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- O. Set wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device.
- P. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
  - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- Q. Maintain headroom and present neat mechanical appearance.
- R. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- S. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- T. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- U. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- V. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- W. Use flush mounting outlet box in finished areas.
- X. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- Y. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- Z. Locate outlet boxes so that wall plates do not span different building finishes.
- AA. Locate outlet boxes so that wall plates do not cross masonry joints.
- AB. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation.
  - 1. Provide minimum 24 inches separation in acoustic rated walls.
  - 2. Provide minimum 24 inches separation in fire rated walls.
- AC. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- AD. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- AE. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

- AF. Use adjustable steel channel fasteners for hung ceiling outlet box.
- AG. Do not fasten boxes to ceiling support wires.
- AH. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- AI. Use gang box where more than one device is mounted together. Do not use sectional box.
- AJ. Use gang box with plaster ring for single device outlets.
- AK. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- AL. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AM. Set floor boxes level.

### **3.02 ADJUSTING**

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

### **3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**END OF SECTION**





**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Underground warning tape.
- E. Warning signs and labels.

**1.02 REFERENCE STANDARDS**

- A. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.06 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION REQUIREMENTS**

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Switchboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location when not within sight of equipment.
      - 4) Use identification nameplate to identify main overcurrent protective device.
      - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Motor Control Centers:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.

- 3) Identify power source and circuit number. Include location when not within sight of equipment.
  - 4) Use identification nameplate to identify main overcurrent protective device.
  - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- c. Panelboards:
- 1) Identify ampere rating.
  - 2) Identify voltage and phase.
  - 3) Identify power source and circuit number. Include location when not within sight of equipment.
  - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
  - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
  - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- d. Transformers:
- 1) Identify kVA rating.
  - 2) Identify voltage and phase for primary and secondary.
  - 3) Identify power source and circuit number. Include location when not within sight of equipment.
  - 4) Identify load(s) served. Include location when not within sight of equipment.
- e. Enclosed switches, circuit breakers, and motor controllers:
- 1) Identify voltage and phase.
  - 2) Identify power source and circuit number. Include location when not within sight of equipment.
  - 3) Identify load(s) served. Include location when not within sight of equipment.
2. Service Equipment:
- a. Use identification nameplate to identify each service disconnecting means.
  - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
  - c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
3. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
- a. Minimum Size: 3.5 by 5 inches.
  - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  2. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

- a. At each source and load connection.
  - b. Within boxes when more than one circuit is present.
  - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- C. Identification for Raceways:
- 1. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
  - 2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
  - 3. Use underground warning tape to identify underground raceways.
- D. Identification for Boxes:
- 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
- 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
    - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
  - 2. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
- F. Buried Electrical Lines: Underground warning tapes.
- G. Communication Cabinets: Nameplates.
- H. Electrical Distribution and Control Equipment Enclosures: Nameplates.
- I. Junction Box Load Connections: Wire markers.
- J. Outlet Box Load Connections: Wire markers.
- K. Panel Gutter Load Connections: Wire markers.
- L. Pull Box Load Connections: Wire markers.

## **2.02 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Identification Nameplates:
- 1. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
  - 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
  - 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
  - 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
- 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend:
    - a. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. Equipment Designation: 1/2 inch.
    - b. Other Information: 1/4 inch.
  5. Color:
    - a. Normal Power System: White text on black background.
- D. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch.
  5. Color: Black text on yellow background unless otherwise indicated.
- E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Power source and circuit number or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Load controlled or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.

### **2.03 WIRE AND CABLE MARKERS**

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch.
- F. Color: Black text on white background unless otherwise indicated.
- G. Description: Vinyl cloth type self-adhesive wire markers.

### **2.04 UNDERGROUND WARNING TAPE**

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
  1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
- B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
  - 1. Tape for Buried Power Lines: Black text on red background.
  - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

## **2.05 WARNING SIGNS AND LABELS**

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
    - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
  - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
    - a. Do not use labels designed to be completed using handwritten text.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Conduits: Legible from the floor.
  - 8. Boxes: Outside face of cover.
  - 9. Conductors and Cables: Legible from the point of access.
  - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**SECTION 26 09 23**  
**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Occupancy sensors.

**1.02 REFERENCE STANDARDS**

- A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
- B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association; 2011.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 773 - Plug-in Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
- I. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- J. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- K. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- C. Field Quality Control Reports.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

## **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

## **1.07 FIELD CONDITIONS**

## **1.08 WARRANTY**

- A. Provide five year manufacturer warranty for all occupancy sensors.

## **PART 2 PRODUCTS**

### **2.01 ALL LIGHTING CONTROL DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

### **2.02 OCCUPANCY SENSORS**

- A. All Occupancy Sensors:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
  - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
  - 7. Turn-Off Delay: Field adjustable.
  - 8. Sensitivity: Field adjustable.
  - 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
  - 10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
  - 11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
- B. Wall Switch Occupancy Sensors:
  - 1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
    - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
    - d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.



2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
- C. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
    - c. Provide field selectable setting for disabling LED motion detector visual indicator.
    - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
    - e. Finish: White unless otherwise indicated.
  2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 1000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
- D. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
  2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
  3. Input Supply Voltage: Dual rated for 120/277 V ac.
  4. Load Rating: As required to control the load indicated on the drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.

- F. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- G. Occupancy Sensor Locations:
  - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
  - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

#### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

#### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

#### **3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

**END OF SECTION**

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.02 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- H. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: For each panelboard and related equipment.
1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    - a. Enclosure types and details for types other than NEMA 250, Type 1.
    - b. Bus configuration, current, and voltage ratings.
    - c. Short-circuit current rating of panelboards and overcurrent protective devices.
    - d. UL listing for series rating of installed devices.
    - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  2. Wiring Diagrams: Power, signal, and control wiring.
- D. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces. Include the following:
1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Panelboard Keys: Two of each different key.
- K. QUALITY ASSURANCE
1. Conform to requirements of NFPA 70.
  2. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- L. DELIVERY, STORAGE, AND HANDLING
1. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
  2. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
  3. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).

- B. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## 2.02 ALL PANELBOARDS

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
  - 3. Label equipment utilizing series ratings as required by NFPA 70.
- C. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- D. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- E. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
  - 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
    - c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    - e. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    - c. Provide removable end walls for NEMA Type 1 enclosures.
    - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- H. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- I. Load centers are not acceptable.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  - 1. Provide bolt-on type.
  - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
  - 3. Provide electronic trip circuit breakers where indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - 2) 14,000 rms symmetrical amperes at 480 VAC.

- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
- 3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Copper, suitable for terminating copper conductors only.
- 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
  - b. Provide interchangeable trip units where indicated.
- 5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  - a. Provide the following field-adjustable trip response settings:
    - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
    - 2) Long time delay.
    - 3) Short time pickup and delay.
    - 4) Instantaneous pickup.
    - 5) Ground fault pickup and delay where ground fault protection is indicated.
- 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- 7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
- 8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
- 9. Do not use tandem circuit breakers.
- 10. Do not use handle ties in lieu of multi-pole circuit breakers.
- 11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
- 12. Provide the following features and accessories where indicated or where required to complete installation:
  - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
  - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## **2.06 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

- D. Provide required supports in accordance with Section 26 05 29.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- H. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- I. Provide grounding and bonding in accordance with Section 26 05 26.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
  - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- J. Install all field-installed branch devices, components, and accessories.
- K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- L. Set field-adjustable circuit breaker tripping function settings as directed.
- M. Set field-adjustable ground fault protection pickup and time delay settings as directed.
- N. Provide filler plates to cover unused spaces in panelboards.

### **3.03 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
- B. Create a directory to indicate installed circuit loads (after balancing panelboard loads). The Contractor shall be responsible for updating directories to indicate actual area served which is not necessarily the description indicated on the bid documents. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws or rivets.

### **3.04 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than \_\_\_\_\_ amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
  - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- H. Correct deficiencies and replace damaged or defective panelboards or associated components.

### **3.05 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.



- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.06 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



**SECTION 26 27 17**  
**EQUIPMENT WIRING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Conform to NEMA WD 1.
  - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 16412 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 34.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 37.

**2.02 EQUIPMENT CONNECTIONS**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

**3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.

- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**

**SECTION 26 27 26**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.
- F. Poke-through assemblies.
- G. Access floor boxes.

**1.02 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- F. NEMA WD 6 - Wiring Device -- Dimensional Specifications; National Electrical Manufacturers Association; 2002 (R2008).
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
  - 6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

- B. Sequencing:
  - 1. Do not install wiring devices until final surface finishes and painting are complete.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Hubbell Incorporated;: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
- B. Leviton Manufacturing Company, Inc;: [www.leviton.com](http://www.leviton.com).
- C. Pass & Seymour, a brand of Legrand North America, Inc;: [www.legrand.us](http://www.legrand.us)
- D. Arrow
- E. Approved equal.
- F. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

#### **2.02 APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- D. Provide GFI protection for all receptacles installed within 6 feet of sinks.
- E. Provide GFI protection for all receptacles installed in kitchens.
- F. Provide GFI protection for all receptacles serving electric drinking fountains.
- G. Provide isolated ground receptacles for all receptacles serving computers.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.
- I. For flush floor service fittings, use tile rings for installations in tile floors.
- J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

#### **2.03 ALL WIRING DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Coordinate color of finish, style and device face plate color with Architect prior to ordering devices.

#### **2.04 WALL SWITCHES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

## 2.05 WALL DIMMERS

- A. Manufacturers:
  - 1. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 2. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Incandescent Wall Dimmers: 120 V AC, slide control type with separate on/off switch; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 1000 W unless otherwise indicated or required to control the load indicated on the drawings.
- D. Magnetic Low-Voltage Wall Dimmers: 120 V AC, slide control type with separate on/off switch; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 1000 VA unless otherwise indicated or required to control the load indicated on the drawings.
- E. Electronic Low-Voltage Wall Dimmers: 120 V AC, slide control type with separate on/off switch; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 400 VA unless otherwise indicated or required to control the load indicated on the drawings.
- F. Fluorescent Wall Dimmers: 120 V AC, slide control type with separate on/off switch, compatible with dimming ballast controlled; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 1000 VA unless otherwise indicated or required to control the load indicated on the drawings.

## 2.06 RECEPTACLES

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; single or duplex as indicated on the drawings.
  - 3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFI Receptacles:

1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
  - a. Provide test and reset buttons of same color as device.
2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

## **2.07 WALL PLATES**

- A. All Wall Plates: Comply with UL 514D.
  1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard.
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

## **2.08 FLOOR BOX SERVICE FITTINGS**

- A. Manufacturers:
  1. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. Description: Service fittings compatible with floor boxes provided under Section 26 05 37 with all components, adapters, and trims required for complete installation.
- C. Flush Floor Service Fittings:
  1. Dual Service Flush Combination Outlets:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      - 2) Communications:.
  2. Dual Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
      - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).

## **2.09 POKE-THROUGH ASSEMBLIES**

- A. Manufacturers:
  1. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.



- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that openings in access floor are in proper locations.
- I. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Wall Dimmers: 48 inches above finished floor.
    - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 3. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
  - 4. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 5. Provide separate outlet boxes for wiring devices connected to emergency power and normal power systems.
  - 6. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
  - 7. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
  - 8. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
  - 9. Locate outlet boxes so that wall plate does not span different building finishes.
  - 10. Locate outlet boxes so that wall plate does not cross masonry joints.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Install identification label for wall switches and wall dimmers in accordance with Section 26 05 26 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.
- R. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for damage and defects.
- B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- C. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

#### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

#### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**SECTION 26 28 18**  
**ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).

- B. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## 2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Horsepower Rating: Suitable for connected load.
- D. Voltage Rating: Suitable for circuit voltage.
- E. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Minimum Ratings:
    - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
    - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
    - c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- F. Provide with switch blade contact position that is visible when the cover is open.
- G. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
  - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- J. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
    - c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    - e. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- L. Heavy Duty Switches:
  - 1. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

- M. Provide the following features and accessories where indicated or where required to complete installation:
  - 1. Hubs: As required for environment type; sized to accept conduits to be installed.
  - 2. Integral fuse pullers.
  - 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
  - 4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

#### **3.03 FIELD QUALITY CONTROL**

- A. Perform field inspection in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

#### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

#### **3.05 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



**SECTION 26 51 00**  
**INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Fluorescent dimming ballasts and controls.
- F. Fluorescent emergency power supply units.
- G. Lamps.
- H. Luminaire accessories.

**1.02 REFERENCE STANDARDS**

- A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.
- B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.
- C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.
- D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.
- E. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (R2008).
- F. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- H. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011.
- K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2012.
- L. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- M. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.
- O. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- P. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- Q. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
- R. UL 1598 - Luminaires; Current Edition, Including All Revisions.

- S. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

### **1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
  - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
  - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
  - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. ANSI/CEC - National Electrical Code.
- C. ANSI/NFPA 101 - Life Safety Code.
- D. Title-24 C.C.R.

### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  - 1. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
  - 2. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
  - 3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
  - 4. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.
- C. Samples:
  - 1. Provide one sample(s) of each luminaire proposed for substitution upon request.
- D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- E. Field Quality Control Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
  - 3. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.



4. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
- I. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.07 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty for all linear fluorescent ballasts.
- C. Provide five year pro-rata warranty for batteries for emergency lighting units.
- D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.
- E. Provide three year full warranty for fluorescent emergency power supply units.

### **PART 2 PRODUCTS**

#### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

#### **2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
  1. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
  2. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
  3. Air-Handling Recessed Fluorescent Luminaires: Suitable for air supply/return, heat removal, or combination as indicated.

- H. Fluorescent Luminaires:
  - 1. Provide ballast disconnecting means complying with NFPA 70 where required.
  - 2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
  - 3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with stepped-dimming ballast.

### **2.03 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Sealed maintenance-free lead calcium unless otherwise indicated.
  - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Accessories:
  - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

### **2.04 FIXTURE TYPES**

- A. Furnish products as indicated in Schedule included on the Drawings.

### **2.05 EXIT SIGNS**

- A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.
- B. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single or double as indicated or as required for the installed location.
  - 2. Directional Arrows: As indicated or as required for the installed location.
- C. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.
  - 1. Provide fixtures complying with NFPA 101.
  - 2. Lamps: LED.
  - 3. Mounting: As indicated.

### **2.06 BALLASTS AND DRIVERS**

- A. All Ballasts:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Fluorescent Ballasts:
  - 1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
    - a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
    - b. Total Harmonic Distortion: Not greater than 10 percent.
    - c. Power Factor: Not less than 0.95.

- d. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
  - e. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
  - f. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
  - g. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
  - h. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
    - 1) Do not operate lamp(s) within the frequencies from 30 kHz through 40 kHz in order to avoid interference with infrared devices.
  - i. Lamp Current Crest Factor: Not greater than 1.7.
  - j. Lamp Wiring Method:
    - 1) Instant Start Ballasts: Parallel wired.
    - 2) Rapid Start Ballasts: Series wired.
    - 3) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
  - k. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
  - l. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
  - m. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
  - n. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
  - o. Ballast Marking: Include wiring diagrams with lamp connections.
2. Non-Dimming Fluorescent Ballasts:
- a. Lamp Starting Method:
    - 1) T8 Lamp Ballasts: Instant start unless otherwise indicated.
    - 2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.
    - 3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
  - b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F, and energy saving lamp(s) at a minimum of 60 degrees F unless otherwise indicated.
3. Dimming Fluorescent Ballasts:
- a. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker and with even tracking across multiple lamps.
  - b. Control Compatibility: Fully compatible with the dimming controls to be installed.
  - c. Lamp Starting Method: Programmed start unless otherwise indicated.
  - d. Lamp Starting Temperature: Capable of starting lamp(s) at a minimum of 50 degrees F.
  - e. Dimmed Lamp Starting: Capable of starting lamp(s) at any dimmed preset without transitioning first to full light output.
4. Bi-Level Stepped Dimming Linear Fluorescent Ballasts:
- a. Bi-Level Operation: Capable of being switched between full light output on all lamps, 50 percent of full light output on all lamps, and all lamps off.
  - b. Control Compatibility: Capable of being controlled by standard manual light switches or occupancy sensors unless otherwise indicated.
  - c. Lamp Starting Method: Programmed start unless otherwise indicated.
  - d. Lamp Starting Temperature: Capable of starting lamp(s) at a minimum of 50 degrees F.

- C. High Intensity Discharge (HID) Ballasts: Complying with ANSI C82.4 and listed and labeled as complying with UL 1029.
  - 1. Electronic Metal Halide Ballasts:
    - a. All Electronic Metal Halide Ballasts:
      - 1) Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      - 2) Total Harmonic Distortion: Not greater than 15 percent.
      - 3) Power Factor: Not less than 0.90.
      - 4) Provide thermal protection with automatic reset.
      - 5) Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      - 6) Lamp Operating Frequency: Less than 200 Hz or as required to avoid acoustic resonance in lamp arc tube.
      - 7) Lamp Current Crest Factor: Not greater than 1.5.
      - 8) Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of -22 degrees F.
      - 9) Provide end of lamp life automatic shut down circuitry.
      - 10) Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
      - 11) Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.

## **2.07 FLUORESCENT EMERGENCY POWER SUPPLY UNITS**

- A. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Compatibility:
  - 1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.
  - 2. Lamps: Compatible with low-mercury lamps.
- C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.
- E. Emergency Illumination Output:
  - 1. Luminaires with F32T8 Lamps: Operate two lamp(s) at a minimum of 1350 lumens unless otherwise indicated with indicated illumination evenly divided between the lamps.
  - 2. Luminaires with F28T5 Lamps: Operate one lamp(s) at a minimum of 1325 lumens unless otherwise indicated.
  - 3. Luminaires with F54T5HO Lamps: Operate one lamp(s) at a minimum of 1250 lumens unless otherwise indicated.
- F. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.
- G. Operating Temperature: From 32 degrees F to 122 degrees F unless otherwise indicated or required for the installed location.
- H. Accessories:
  - 1. Include TEST switch and AC ON indicator light, installed to be operable and visible integral to fixture.

## 2.08 LAMPS

- A. Manufacturers:
  - 1. General Electric Company/GE Lighting;: [www.gelighting.com](http://www.gelighting.com).
  - 2. Osram Sylvania;: [www.sylvania.com](http://www.sylvania.com).
  - 3. Philips Lighting Company;: [www.lighting.philips.com](http://www.lighting.philips.com).
  - 4. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
  - 5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. All Lamps:
  - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
  - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
  - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
  - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.
- C. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  - 1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  - 2. Correlated Color Temperature (CCT): 4,100 K unless otherwise indicated.
  - 3. Color Rendering Index (CRI): Not less than 80.
  - 4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.
- D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  - 1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  - 2. T8 Linear Fluorescent Lamps:
    - a. Correlated Color Temperature (CCT): 4,100 K unless otherwise indicated.
    - b. Color Rendering Index (CRI): Not less than 80.
    - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
  - 3. T5 Linear Fluorescent Lamps:
    - a. Correlated Color Temperature (CCT): 4,100 K unless otherwise indicated.
    - b. Color Rendering Index (CRI): Not less than 80.
    - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
- E. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
  - 1. Metal Halide Lamps:
    - a. Non-Reflector Type Metal Halide Lamps: Phosphor coated lamp finish unless otherwise indicated.
    - b. Provide ANSI type O-rated protected metal halide lamps where required for open luminaires provided with compatible exclusionary sockets.
    - c. Ceramic Metal Halide Lamps:
      - 1) Correlated Color Temperature (CCT): 4,000 K unless otherwise indicated.
      - 2) Color Rendering Index (CRI): Not less than 80.
- F. Lamp Types: As specified for each fixture.

## **2.09 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure pendant-mounted luminaires to building structure.
  - 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
  - 6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- F. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- G. Suspended Luminaires:
  - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
  - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
  4. Install canopies tight to mounting surface.
  5. Unless otherwise indicated, support pendants from swivel hangers.
- H. Wall-Mounted luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 and 502.
- J. Surface Mounted Fixtures: Install plumb and square and aligned with building lines and with each other; secure to prevent movement.
- K. Wall Mounted Fixtures: Install at height as indicated on the drawings.
- L. Install accessories furnished with each luminaire.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.
- O. Air Handling luminaires: Interface with air handling accessories furnished and installed under Section 23 36 00.
- P. Fluorescent luminaires controlled by dual-level switching: Connect such that each switch controls the same corresponding lamps in each luminaire.
- Q. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- R. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- S. Fluorescent Emergency Power Supply Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.
- T. Remote Ballasts: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
- U. Install lamps in each luminaire.
- V. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- W. Install in accordance with manufacturers instructions.
- X. Install specified lamps in each luminaire, emergency lighting unit and exit sign.
- Y. Verify all ceiling types and provide lighting fixtures with suitable mounting hardware for mounting in or on subject ceiling.
- Z. Surface Mounted Fluorescent Fixtures: Where fixtures are indicated for installation on low-density cellulose fiberboard (see room finish schedule on drawings), provide 1-1/2" insulation, unless UL approved for mounting directly to the ceiling material.
- AA. Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Coordinate complete fixture installation with the building construction.
- AB. Where special fixtures to be used in special ceiling are scheduled, verify all ceiling systems and coordinate fixture type and accessories prior to ordering fixtures. Coordinate and cooperate with ceiling supplier in the preparation of ceiling system Shop Drawings.

- AC. Install fluorescent fixtures as recommended by the manufacturer or as necessary to provide exact horizontal alignment, preventing horizontal or vertical deflection on angular jointing of fixtures suspended in continuous rows.
- AD. Two-lamp ballasts shall be allowed to feed single lamps in tandem fixtures and shall be properly identified to show which lamps are fed from this ballast by markers on the fixture and the ballast. Provide the quantity and type of ballasts required to achieve switching configuration indicated on the drawings.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- F. Each fluorescent fixture when initially energized shall be left on continuously for 100 consecutive hours to properly burn in fluorescent lamps.

#### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.
- D. Aim and adjust fixtures as indicated.
- E. Position exit sign directional arrows as indicated.

#### **3.06 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

#### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

#### **3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

#### **3.09 SCHEDULE - SEE DRAWINGS**

**END OF SECTION**



**SECTION 26 51 20**  
**AUTOMATIC LIGHTING CONTROL SYSTEM**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. Provide and design an automatic lighting control system as described in this specification and as called for on the drawings.

**1.02 QUALITY ASSURANCE**

- A. Manufacturer shall have a minimum of 10 years experience in manufacturing and installing this type of system.
- B. The Contractor shall provide a list of recent jobs completed during the last 5 years with the name and phone number of a contact person.
- C. All components and assemblies are to be pre-tested and assembled at the factory prior to installation.
- D. Provide a factory-trained technician on site. The technician shall functionally test each component in the system after installation to verify proper operation and confirm that the panel wiring and addressing conform to the wiring documentation.

**1.03 SUBMITTALS**

- A. The following list includes the required shop drawings and product data information that shall be submitted.
  - 1. Underwriters Laboratories, Inc. (UL) listing and factory test reports.
  - 2. Internal and system wiring diagrams.
  - 3. Single line diagram of the system configuration. Typical riser diagrams are not acceptable.
  - 4. Dimensions of the equipment layout.
  - 5. Control wiring and conduits layout and connections.
  - 6. Floor plans to scale showing the location of each device and equipment.
  - 7. Product data of all the components including but not limited to programmable central controllers, transceivers panels, input relays, switches and other ancillary equipment.

**1.04 REFERENCES**

- A. UL 916 Energy Management Equipment.
- B. FCC Emissions Standards specified in Part 15, subpart J for Class A, Applications.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Provide and microprocessor controlled relay panels for the Lighting Control System. The system shall include programmable standalone master panel, switch inputs, wiring, power supplies, relays and ancillary relays.
- B. Panels shall be capable of standing alone or operating as part of a network.
  - 1. The system shall provide intelligence to operate as follows:
    - a. Store all user operating data.
    - b. Initiate all relay output commands based on:
      - 1) Operator inputs
      - 2) Automatic operating schedule
      - 3) Binary type field sensors
      - 4) Universal override switch inputs
      - 5) Internal 56K Baud modem
    - c. Provide automatic system diagnostics and alarming based on detected faults in the controller, transceiver panels, relays, and data line.
  - 2. System shall include a memory back up to be able to survive an indefinite length of power failure.

- C. Lighting Control Panel (LCP): Microprocessor based, complete prewired assemblies consisting of the following:
1. Stand alone panel controller capable of receiving and acting upon programs downloaded from the central computer. Programs downloaded from the network shall be capable of continuing to operate even if the network should fail. Battery Back up provides 8 days of memory retention. Panel shall be part of a system that can control up to 750 relays and receive up to 500 switch inputs. Panel shall have an USB input for local programming and trouble shooting from a laptop computer.
  2. Internal digital clock with self control power.
  3. Output modules: Plug in type to receive coded digital commands from the panel controller and pulse output relays to the appropriate state. Actual status feedback of the relays are to be fed back to the panel controller and from there to the central computer. Actual status of each relay is to be indicated by a pilot LED on the control board. Each Module controls 8 or 16 relays.
  4. Switch input modules: Plug-in type, actuated by remote external contact closures. These contact closures may be either momentary or maintained. The action of the contact is noted by the panel controller and acted upon as programmed by software. The action of the contact can command any group of output relays to the desired state. Either 8 or 24-input channels as shown on the plans.
  5. Output Relays
    - a. Type: Momentary pulsed, mechanically latched with pilot light contact.
    - b. Rating: 20 Ampere, 277VAC
    - c. Number per panel: 16,32 or 48 as required to satisfy this project scope.
  6. The low voltage and high voltage sections of the lighting control cabinet shall be separated by a 14 gage steel barrier in which the relays are mounted. In areas where both 120 volt and 277 volt loads are present the high voltage compartment shall have a 14 gage steel barrier between the relays that carry 120 VAC and the relays that carry 277VAC. Each section shall be clearly labeled as to the voltage in that compartment.
  7. Panel power supply shall be dual primary 115/277 volts AC, 60 Hz.  $\pm$  10%. Low voltage side shall be protected from power line surges and spikes on the input power. The low voltage section shall be protected against short circuit faults and relay failures.
  8. Panels shall be UL approved and shall have a short circuit withstand current rating at 14,000 AIC.
  9. Manufacturer: Lighting Control and Design, or G.E. or equal.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. The Lighting Control System shall be installed and wired completely as required by the equipment manufacturer by the contractor, who shall make all necessary wiring connections to the lighting fixtures, override switches, photo cells and equipment.
- B. The Contractor shall provide on-site programming time with factory-trained personnel for the system set-up. The Contractor shall set up the software program and program the entire system in accordance with the Owner's instructions.
- C. Documentation
  1. Accurate "as-built" drawings shall be provided by the Contractor. These shall indicate the load controlled by each relay and the identification number for that switch connected to an input and the identification number of that input. Three sets of space plans or reflected ceiling plans shall be provided by the contractor indicating which fixtures are controlled by each relay.
  2. A separate data grade private line with RJ45 jack shall be furnished for each modem.

#### **3.02 SERVICE AND SUPPORT**

- A. Startup: After the system has been installed, the Contractor shall provide the services of a factory trained representative of the manufacturer to verify correct operation of all system

components. The contractor shall guarantee all material and workmanship involving the system for three years after startup.

- B. Training: After system startup and after all the programming is completed, the Contractor shall arrange for a factory trained representative to train the Owner's personnel. The trainer shall instruct the Owner's personnel in how to program the system and demonstrate a typical operating program for an area. The Contractor shall allow for 24 hours' instruction time for the Owner's training.
- C. Factory Support: Factory support shall be available free of charge during the three-year warranty period to answer programming and application questions. The manufacturer, or his representative, shall have a remote terminal capable of programming the system to support the Owner's personnel during this period. The Contractor shall include a modem, necessary cabling and telephone extension to support this telecommunications operation. The Contractor shall provide a three-year maintenance service contract as part of the cost.
- D. The Contractor shall also provide a software site licensing so that the Owner will be able to transfer the software program from the main computer to the other computers. This transfer shall not be an extra cost to the Owner.

**END OF SECTION**



**APPENDIX 1**

**Equipment Cut Sheets**

