Project No: 75-21204-00/02

# Specifications for Cypress College Swing Space

North Orange County Community College District

> DLR GROUP DSA Submittal February 4<sup>th</sup>, 2022

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Consultant: DLR Group

Name: Jason Jewell

License No.:

Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

Architectural



Discipline:	Electrical
Consultant:	DLR Group
Name:	Roozbeh Mehrkish
License No.:	E-19355
Responsible for	Sections: Division 26



Discipline:Mechanical/PlumbingConsultant:DLR GroupName:Yam ChapagainLicense No.:M35133Responsible for Sections: Division 22-23





# SECTION 011000 - SUMMARY

# PART 1 - GENERAL

# 1.01 RELATED DOCUMENTS

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

# 1.02 SUMMARY

- A. Section includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Phased construction.
  - 4. Work under separate contracts.
  - 5. Owner-furnished products.
  - 6. Access to site.
  - 7. Coordination with occupants.
  - 8. Work restrictions.
  - 9. Specification and drawing conventions.
- B. Related Section:
  - 1. Division 1 Section "Construction Facilities and Temporary Controls" for limitations and procedures governing temporary use of Owner's facilities.

# 1.03 PROJECT INFORMATION

- A. Project Identification: Music/Theatre Complex (Bldg G)
  - 1. Project Location: 9200 Valley View Street, Cypress CA 90630
- B. Owner: North Orange County Community College District
- C. Owner's Representative:
  - 1. Confirm
- D. Architect: DLR Group
  - 1. Dan Clevenger, Principal DLR Group. Phone: (602) 381-8580

# 1.04 WORK COVERED BY CONTRACT DOCUMENTS

- A. Scope of Work: The Contractor's Work includes:
  - 1. Renovation of existing SEM Building.
  - 2. New room signage.
  - 3. Demolition of existing walls as indicated on drawings.
  - 4. New floor and wall finishes as indicated on drawings.
  - 5. Classrooms to receive new casework and furnishings as indicated.
- B. Work scope is pursuant to the scope of work delineated in the attached drawings prepared by DLR Group dated 01/28/2022.
- C. Type of Contract:
  - 1. Project will be constructed under a single prime contract with the Contractor.

# 1.05 PHASED CONSTRUCTION

A. The Work may require to be completed in multiple phases as outlined in the general conditions.

# 1.06 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

# 1.07 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated. Contractor to coordinate with the OWNER'S AUTHORISED REPRESENTATIVE on site access.
  - 1. Limits: Confine construction operations to areas indicated on Drawings.
  - 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations and prevent disruption to the District, especially during exam times.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- c. All deliveries through public spaces, including parking lots, should be escorted to and from the site by two (2) flag men at the front and rear of the vehicle.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations.

# 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction. Contractor to be especially aware to the Districts academic calendar and ensure no disruption to exam times or any other special events by the District, times and dates for which have not yet been identified.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Notify Construction Manager no less than a minimum two (2) weeks of proposed utility interruptions.
  - 2. Obtain Construction Manager's written permission before proceeding with utility interruptions.
  - 3. All Utilities cutovers should be performed after-hours or during weekends, unless otherwise indicated.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Construction Manager no less than a minimum one (1) week in advance of proposed disruptive operations.
  - 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the construction site building or on campus.
- F. Controlled Substances: Use of tobacco products and other controlled substances on the College Campus is not permitted.
- G. Employee Identification: Provide identification tags for personnel working on the Project site. Require personnel to utilize identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements regarding drugs and Background screening of Contractor's personnel working on the Project site.

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

# 1.9 SPECIFICATION AND DRAWING CONVENTIONS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 012100 - ALLOWANCES

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
  - 1. An Allowance has been established for conditions that may be encountered during the course of Construction.
- B. Related Sections:
  - 1. Divisions 2 through 33 Sections for items of Work covered by allowances.

# 1.3 SUBMITTALS

- A. Submit proposals for proposed changes designated as allowances, in the format specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

#### 1.5 ALLOWANCE COST PROPOSALS

- A. Allowance cost proposals shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's cost proposals shall be inclusive of all material and labor, overhead and profit, and other costs, as included in the General Conditions for Change Orders.

# PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.
- 3.2 PREPARATION
  - A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.
- 3.3 SCHEDULE OF ALLOWANCES
  - A. Allowance No.1: Lump-Sum Allowance: Include the sum of \$50,000 for unforeseen conditions including, but not limited to, abandoned or active utility lines, irrigation lines, etc., not shown in record drawings, or any item determined by the Owner at their discretion. This Allowance is strictly to be used at the Owner discretion and should not be consider part of the Contractors basic services.
    - 1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.

# SECTION 012500 - SUBSTITUTION PROCEDURES

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
  - 1. Division 1 Section "Allowances" for products selected under an allowance.
  - 2. Division 1 Section "Materials and Equipment" for requirements for submitting comparable product submittals for products by listed manufacturers.
  - 3. Divisions 2 through 33 Sections for specific requirements and limitations for substitutions.

#### 1.3 DEFINITIONS

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

#### 1.4 SUBMITTALS

- A. Product Substitution Submittal: Submit request for consideration of each product to be substituted. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Submittal Form: Use CSI Form 13.1A or Contractor's comparable form.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

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

# 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.
  - 1. Contractor is responsible for providing products and construction methods compatible with products and construction methods previously selected.
  - 2. If a dispute arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

# 1.6 PROCEDURES

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

# PART 2 - PRODUCTS

# 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit product substitution submittal immediately upon discovery of need for change, but not later than thiry-five 35 days following the date of the Owner's Award of Contract to the Contractor by action of the Board of Trustee's.
  - 1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Substitute product offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Substitute product is consistent with the Contract Documents and will produce indicated results.
      - 1) Use of proposed product does not require revisions to the Contract Documents.
    - c. Product substitution submittal is fully documented and properly submitted.
      - 1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

- 2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
- 3) Samples, if requested.
- d. Use of proposed product will not adversely affect Contractor's construction schedule.
- e. Substitute product has received necessary approvals of authorities having jurisdiction.
- f. Substitute product is compatible with other portions of the Work.
- g. Use of proposed product has been coordinated with other portions of the Work.
- h. Substitute product provides specified warranty.
- i. If use of proposed product involves more than one contractor, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider product substitution submittals if received within 35 days after the Notice of Award unless otherwise indicated. Requests received after that time may be considered or rejected at discretion of Architect.
  - 1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Substitute product offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Substitute product is consistent with the Contract Documents and will produce indicated results.
      - 1) Use of proposed product does not require revisions to the Contract Documents.
    - c. Product substitution submittal is fully documented and properly submitted.
      - 1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      - 2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
      - 3) Samples, if requested.

- d. Use of proposed product will not adversely affect Contractor's construction schedule.
- e. Substitute product has received necessary approvals of authorities having jurisdiction.
- f. Substitute product is compatible with other portions of the Work.
- g. Use of proposed product has been coordinated with other portions of the Work.
- h. Substitute product provides specified warranty.
- i. If use of proposed product involves more than one contractor, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

# SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections:
  - 1. Division 1 Section "Section 012500 Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

# 1.3 ADDENDA

A. Addenda shall be signed by Architect and approved by DSA.

# 1.4 MINOR CHANGES IN THE WORK

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

# 1.5 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Project Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. Request will be generated and must be responded to. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Project Manager are not instructions either to stop work in progress or to execute the proposed change.
  - 2. **Within 10 days**, unless indicated otherwise, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. Refer to the General Conditions for additional requirements.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

- b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- c. Include costs of labor and supervision directly attributable to the change.
- d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.
- B. Contractor Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Project Manager and Architect.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 6. Comply with requirements in Division 1 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  - 7. Proposal Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.

# 1.6 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 1 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

# 1.7 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, the Project Manager will issue a Change Order, for signatures of Owner, Architect, and Contractor.
  - 1. Change Orders shall be signed by the Architect, Contractor, Owner and Project Manager.

# 1.8 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Project Manager may issue a Construction Change Directive, to instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 012900 - PAYMENT PROCEDURES

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### B. Related Sections:

- 1. Division 1 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
- 2. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
- 3. Division 1 Section "Construction Schedule" for administrative requirements governing the preparation and submittal of Contractor's Contractor schedule.
- 4. Division 1 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of submittal schedule.

# 1.3 DEFINITIONS

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

# 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's Contractor schedule.
  - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's Contractor schedule.

- 2. Submit the schedule of values to the PROJECT MANAGER at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- 3. Sub-schedules for Phased Work: If at any time the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- 4. Sub-schedules for Separate Elements of Work: Where the Contractor's Contractor schedule defines separate elements of the Work; provide sub-schedules showing values correlated with each element.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Name of IOR.
    - d. Name of Project Manager.
    - e. Project Number.
    - f. Contractor's name and address.
    - g. Date of submittal.
  - 2. Arrange schedule of values consistent with format of AIA Document G703.
  - 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      - 1) Labor.
      - 2) Materials.
      - 3) Equipment.
  - 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  - 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

- 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
- 7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
- 10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

# 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
  - 1. Contractor shall provide a draft of the Payment Application on the 25<sup>th</sup> of the month proceeding the end of the period for review by Project Manager, the IOR and the Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Project Manager and Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Materials previously stored and included in previous Applications for Payment.
    - b. Work completed for this Application utilizing previously stored materials.
    - c. Additional materials stored with this Application.
    - d. Total materials remaining stored, including materials with this Application.
- F. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 1. Submit required waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

- 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of principal suppliers, fabricators, and subcontractors.
  - 2. Certified Schedule of Values.
  - 3. Contractor's Contractor schedule (preliminary if not final).
  - 4. Products list (preliminary if not final).
  - 5. Copies of building permits.
  - 6. Certificates of insurance and insurance policies.
  - 7. Performance and payment bonds.
  - 8. Data needed to acquire Owner's insurance.
  - 9. Construction Schedule
  - 10. Submittal Schedule (Design Schedule)
  - 11. Certified Payroll
  - 12. Storm Water Pollution Prevention Plan (SWPPP)
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Occupancy permits and similar approvals by authorities having jurisdiction over Work.
  - 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 4. Updated final statement, accounting for final changes to the Contract Sum.
  - 5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  - 6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  - 7. AIA Document G707, "Consent of Surety to Final Payment."
  - 8. Evidence that claims have been settled.
  - 9. Removal of temporary facilities and services.
  - 10. Testing, adjusting and balance records.
  - 11. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  - 12. Start-up performance reports.
  - 13. District training and orientations.
  - 14. Operating and maintenance instruction manuals.
  - 15. Preliminary Warranties, guarantees and maintenance agreements
  - 16. Delivery of extra materials, products and/or stock.

- 17. Final liquidated damages settlement statement.
- 18. Retention Escrow Deposit Request Form (if applicable)
- 19. Consent of Surety to Final Payment
- 20. Conditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
- 21. Unconditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
- 22. Notice of Project Completion & Recommendation of Acceptance (w/required attachments)
- 23. Final Punch List
- 24. Certification Re Insurance
- 25. Certification Re Satisfaction of Indebtedness
- 26. Guarantee Form
- 27. Asbestos and Other Hazardous Materials Certification
- 28. SWPPP and NPDES District Requirements for Maintenance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 012973 - SCHEDULE OF VALUES

# PART 1 - GENERAL

# 1.01 DESCRIPTION

- A. Submit to Owner one (1) copy of an accurate and realistic Schedule of Values (Schedule) allocated to the various portions of the work, at least 15 days prior to the date of the Contractor's first application for payment.
- B. The Schedule of Values, unless objected to by Owner, shall become the basis for the Contractor's application for payment.
  - 1. Upon request by the Project Manager, support values given with data that will substantiate their correctness.
  - 2. Payment for materials stored shall be limited to those materials approved by the Project Manager and is only at the Owner's discretion.
- C. Related requirements specified elsewhere.
  - 1. Project Division 1 General Requirements.
  - 2. Construction Schedule, Section 013210.

# 1.02 FORM OF SUBMITTAL

- A. Identify schedule with:
  - 1. Title of project and location.
  - 2. Specification number.
  - 3. Name and address of Contractor.
  - 4. Date of submission.
- B. Schedule shall list the value of the component parts of work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Use the Construction Schedule (Section 013210) of the project specifications as a basis for the format for listing component items.
- D. List sub-values of major products or operations for each line item. Additional sub-values may be requested by the Project Manager.
- E. Costs for the various portions of the work:
  - 1. Each item shall include a directly proportion amount of the Contractor's overhead and profit.
  - 2. For items on which progress payments will be requested for stored products, list the total installed value, including Contractor's overhead and profit.
- F. A similar detailed schedule, itemizing costs and/or credits in a form satisfactory to the Project Manager shall accompany all quotations for changes in the work or for extra work.
- G. Round off figures to nearest ten dollars whenever possible.

- H. The sum of all values listed in the schedule shall equal the total contract sum.
- I. Schedule of Values submittal to be sent through the Procore

# 1.03 REVIEW AND RESUBMITTAL

- A. After review by the Project Manager, revise and resubmit Schedule as required. Resubmit revised Schedule in same manner.
- B. Progress payments will not be made until Schedule has been approved.

# SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

# 1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Administrative and supervisory personnel.
  - 3. Coordination drawings.
  - 4. Requests for Information (RFIs).
  - 5. Project meetings.
- B. Related Sections:
  - 1. Division 1 Section "Construction Schedule" for preparing and submitting Contractor's construction schedule.
  - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.
  - 4. Division 1 Section "Electronic Project Management Information System" for coordinating with District's Electronic Project Management Information System (PMIS).

# 1.3 DEFINITIONS

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

# 1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

- 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
- 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Pre-installation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.
  - 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

# 1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  - 1. Execution: The mechanical subcontractor shall prepare ductwork fabrication drawings and BIM model for review and coordination with the architect and other design consultants, the electrical, plumbing, sprinkler and other relative subcontractors. Drawings shall be in sufficient detail to show overall ductwork dimensions, clearances, and relative locations of work in allotted spaces. Ductwork routing and sectional elevations shall be provided for congested areas.

The mechanical subcontractor will disseminate the ductwork drawings and will direct and expedite review by the various trades. Each trade shall indicate where conflicts or clearance problems exist for their work and subsequently seek resolution from the Architect/Engineer via General Contractor. Final coordinated drawings shall be produced by the mechanical subcontractor, who shall obtain approval for any changes to duct or pipe sizes and significant changes in routing. Electrical, sprinkler, and other relative subcontractors are required to participate in and cooperate fully with the coordination process.

- a. The mechanical subcontractor to include the GC, Owner and Architect in BIM coordination meetings.
- 2. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
  - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
  - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
  - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
  - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - f. Indicate required installation sequences.
  - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Construction Manager and the Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, IT, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  - 2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  - 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.

- 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
- 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
- 6. Mechanical and Plumbing Work: Show the following:
  - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
  - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
  - c. Fire-rated enclosures around ductwork.
- 7. Electrical Work: Show the following:
  - a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
  - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
  - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
  - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
- 8. Review: Project Manager and Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Construction Manager and Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Construction Manager and Architect will so inform the Contractor, who shall make changes as directed and resubmit.
- 9. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 1 Section "Submittal Procedures."

# 1.6 KEY PERSONNEL

- A. Key Personnel Names: Within **15 days** of starting construction operations, submit, through Procore a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

# 1.7 REQUESTS FOR INFORMATION OR INTERPRETATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
  - 2. RFIs to be sent through Procore
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. Name of Project Manager
  - 6. Name of Architect.
  - 7. RFI number, numbered sequentially.
  - 8. RFI subject.
  - 9. Specification Section number and title and related paragraphs, as appropriate.
  - 10. Drawing number and detail references, as appropriate.
  - 11. Field dimensions and conditions, as appropriate.
  - 12. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 13. Contractor's signature.
  - 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716, CSI Form 13.2A, or Contractor's comparable form. The Contractor is to use Procore for all RFI coordination, See General Conditions.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  - 1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.

- f. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
- 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
  - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the Project Manager and Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or Contractor's comparable form. Include the following:
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Architect.
  - 4. RFI number including RFIs that were dropped and not submitted.
  - 5. RFI description.
  - 6. Date the RFI was submitted.
  - 7. Date Architect's response was received.
  - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

# 1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the Project Manager and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: The Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within three days of the meeting. Historical meeting data will be available through Procore.

- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Project Manager and Architect.
  - 1. Conduct the conference to review responsibilities and personnel assignments.
  - 2. Attendees: Authorized representatives of Owner, Project Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.
    - I. Preparation of record documents.
    - m. Use of the premises and existing building(s).
    - n. Work restrictions.
    - o. Working hours.
    - p. Owner's occupancy requirements.
    - q. Responsibility for temporary facilities and controls.
    - r. Procedures for moisture and mold control.
    - s. Procedures for disruptions and shutdowns.
    - t. Construction waste management and recycling.
    - u. Parking availability.
    - v. Office, work, and storage areas.
    - w. Equipment deliveries and priorities.
    - x. First aid.
    - y. Security.
    - z. Progress cleaning.
  - 4. Minutes: The Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting. Historical meeting data will be available through Procore.
- C. Pre-installation Conferences: The Contractor shall conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction, or prior to a new subcontractor is about to start on site, so their scope can be understood by all parties.

- 1. Attendees: 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 Architect of scheduled meeting dates.
- 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
  - a. Contract Documents.
  - b. Options.
  - c. Related RFIs.
  - d. Related Change Orders.
  - e. Purchases.
  - f. Deliveries.
  - g. Submittals.
  - h. Review of mockups.
  - i. Possible conflicts.
  - j. Compatibility problems.
  - k. Time schedules.
  - I. Weather limitations.
  - m. Manufacturer's written recommendations.
  - n. Warranty requirements.
  - o. Compatibility of materials.
  - p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction.
  - t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
- 3. Minutes: The Contractor is responsible for conducting meeting will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within three days of the meeting. Historical meeting data will be available through Procore.
- 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner, Project Manager, IOR and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
  - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.

- 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
  - a. Preparation of record documents.
  - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
  - c. Submittal of written warranties.
  - d. Requirements for preparing operations and maintenance data.
  - e. Requirements for demonstration and training.
  - f. Preparation of Contractor's punch list.
  - g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
  - h. Submittal procedures.
  - i. Owner's partial occupancy requirements.
  - j. Installation of Owner's furniture, fixtures, and equipment.
  - k. Responsibility for removing temporary facilities and controls.
- 4. Minutes: The Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information. Historical meeting data will be available through Procore.
- E. Progress Meetings: The Project Manager will conduct progress meetings at weekly intervals or at intervals approved by Owner.
  - 1. Contractor shall coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner, Project Manager, Project Inspector and Architect, each contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
  - 1) Interface requirements.
  - 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Progress cleaning.
  - 10) Quality and work standards.
  - 11) Status of correction of deficient items.
  - 12) Field observations.
  - 13) Status of RFIs.
  - 14) Status of proposal requests.
  - 15) Pending changes.
  - 16) Status of Change Orders.
  - 17) Pending claims and disputes.
  - 18) Documentation of information for payment requests.
- 4. Minutes: The Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting. Historical meeting data will be available through Procore.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

# SECTION 013119 - PROGRESS MEETINGS

#### PART 1 - GENERAL

### 1.01 DESCRIPTION

Scheduling and administration of progress meetings.

#### 1. 02 RELATED REQUIREMENTS

- A. Project Division 1 General Requirements
- B. Construction Schedules
- D. Shop Drawings, Product Data and Samples
- E. Quality Requirements

#### 1.03 PROGRESS MEETINGS

- A. The CONTRACTOR will schedule Construction Progress Meetings, coordination meetings and pre-installation conferences throughout the progress of work. Project Manager will be responsible for the administrating and distributing meeting minutes from the weekly site meetings with the CONTRACTOR, but the CONTRACTOR is responsible to minute and distribute all other weekly subcontractor coordination and pre-installation meeting minutes.
- B. The Project Manager will set dates and times, make physical arrangements, prepare agenda and distribute notice of each meeting to Contractor, Architect, and Inspector of Record (IOR) in advance of or at meetings. Agenda, along with all historical meeting data, will be distributed through Procore.
- C. The Project Manager will preside at the weekly construction meeting with the CONTRACTOR; record minutes and distribute copies to participants.
- D. Location of meetings: Project's field office, Construction Site, or Project Manager's office.
- E. Attendance: Project Manager, Project Inspector, Contractor or his authorized representative, and job superintendent, CONTRACTOR Architect. Subcontractors, suppliers and others shall attend as appropriate to agenda; Design Engineers and others shall attend when appropriate.
- F. Minimum Agenda:
  - 1. Approval of minutes of previous meetings.
  - 2. Review of work progress.

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

END OF SECTION 013119

# SECTION 013130 - ELECTRONIC PROJECT MANAGEMENT INFORMATION SYSTEM

### PART 1 – GENERAL

#### 1.1 DESCRIPTION

- A. This Section is in addition to the Contract General Conditions.
- B. The Contractor shall be required to use the District's Electronic Project Management Information System (PMIS), Procore, for electronic construction management document control and communications between the District, Architect of Record, Inspector of Record, other project-related consultants, and Contractor. The system will be maintained and owned by the District but operated collaboratively by the Project Team.
- C. The PMIS will contain the following information available to the contractor and project team:
  - 1. Change Orders (CO) and Logs
  - 2. Construction Change Directives (CCD) and Logs
  - 3. Daily Reports
  - 4. Field Observations and Reports
  - 5. Final Completion
  - 6. Incident Reports and Logs
  - 7. Inspection Requests (IR) and Logs
  - 8. IOR Daily Reports
  - 9. Meeting Minutes
  - 10. Notices to Proceed (NTP)
  - 11. Payment Applications
  - 12. Potential Change Orders (PCO) and Logs
  - 13. Requests for Information (RFI) and Logs

- 14. Submittals and Logs
- 15. Substantial Completion
- 16. Project FTP Site
- 17. Electronic Drawings, Sketches, and Architect's Supplemental Instructions (ASI)
- 18. Other Documentation as determined by the District's Representative.
- D. All Daily Reports, Incident Reports, PCOs, RFIs, and Submittals shall be submitted electronically, via the Procore Website. The District will NOT accept faxed and/or computer generated documentation and/or hand written documentation of these documents.
  - 1. The Contractor shall be solely responsible for data entry via the Procore Website.
  - 2. The Contractor shall be solely responsible for the scanning of sketches / drawings as necessary for the electronic submittal and attachment of required information.
  - 3. The Contractor shall supply field personnel all necessary computer equipment required for electronic data entry.
  - 4. Submittals shall be submitted via Procore, with hard copies provided per Section 013300 Submittal Procedures.
- 1.2 CONTRACTOR'S RESPONSIBILITIES
  - A. The Contractor shall have sufficient computer(s) with capabilities to access the system at their on-site and off-site project offices. At the pre-construction meeting, the Contractor shall provide to the District's Representative the email address of all Contractor representative(s) that the Contractor designates to have access to the PMIS. This representative(s) shall have sufficient computer skills required to access the Internet, log on to the PMIS, and utilize the PMIS. The District shall provide technical support to the Contractor's personnel for use of the PMIS. The Contractor shall plan on an average of 4-hours training for the Contractor's representative(s) who will be using the system. Each representative shall complete the Procore Certification: Project Manager at GC (Project Management), and provide a copy of the completion certificate to Project Manager, prior to utilizing the PMIS. Having the above capability in place on-site is a condition precedent to processing the Contractor's first payment request.

# 1.3 OFFICIAL RECORDS

A. The documentation and records maintained on the PMIS will be the "Official Records" for the project. This documentation shall be the records for the adjudication of any and all disputes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013130

# SECTION 013210 - CONSTRUCTION SCHEDULE

### PART 1 - GENERAL

### 1.01 SECTION INCLUDES

- A. Required procedures, preparation, submittals, reviews, updates, and revisions to the cost/schedule integrated construction schedule. The purpose of this section is to:
  - 1. Ensure adequate planning and execution of the Work by CONTRACTOR.
  - 2. Establish a standard against which satisfactory completion of the Project can be measured by OWNER.
  - 3. Assist CONTRACTOR and the Project Manager in monitoring progress.
  - 4. Aid in assessing the impact of any changes to the Contract.
  - 5. Provide justification for progress payments.

#### 1.02 RELATED SECTIONS

- A. General and Special Conditions
- B. Section 012900: Payment Procedures
- C. Section 013100: Project Management and Coordination
- D. Section 013300: Submittal Procedures
- E. Section 012973: Schedule of Values
- F. Section 014523: Testing and Inspection
- G. Section 015000: Construction Facilities And Temporary Controls
- H. Section 017700: Closeout Procedures

#### PART 2 – PRODUCTS

- 2.01 SCHEDULING SOFTWARE
  - A. CONTRACTOR shall utilize Primavera P6 software (latest version) by Primavera Systems, Inc., or equivalent scheduling software to employ the Critical Path Method (CPM) in the development and maintenance of the construction schedule network using the Precedence Diagram Mode (PDM). The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource

histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

B. All schedule calculation rules, auto cost rules and resource calculation rules shall be in a format acceptable to Project Manager. When schedule calculations are performed, the "Retained Logic" setting shall be used. CONTRACTOR shall use the zero (0) "Decimal Places" setting.

#### PART 3 – EXECUTION

#### 3.01 SUBMITTALS

- Α. CONTRACTOR shall retain a construction scheduler to work in enough capacity to perform all of the requirements outlined in this Section. CONTRACTOR shall submit, through Procore, a resume of the proposed Scheduler for review and acceptance prior to the preparation of any Schedule. The resume shall demonstrate the proposed scheduler's capability to plan, coordinate, execute, and monitor a cost/resource loaded CPM schedule as required for this Project and have a minimum of five (5) years direct experience using Primavera P6. Scheduler will cooperate with Project Manager and shall be available on site for monitoring, maintaining and updating schedules in a timely manner. Project Manager has the right to refuse to accept the Scheduler based upon a lack of experience as required by this Section or based on lack of performance and timeliness of schedule submittals/fragnets on past projects. If the Project Manager does not accept the proposed Scheduler, CONTRACTOR shall within one (1) week of disapproval, propose another scheduler who meets the experience requirements stated above.
- B. CONTRACTOR shall submit, through Procore, the Preliminary Construction Schedule within 10 days after Notice to Proceed (NTP).
- C. CONTRACTOR shall submit, through Procore, the Proposed Baseline Schedule as required by the date stipulated in Section 013210-3.04.
- D. CONTRACTOR shall submit the Monthly Schedule Updates, Four-Week Rolling Schedules, and Recovery Schedules as required.

### 3.02 PRELIMINARY CONSTRUCTION SCHEDULE

- A. The purpose of the cost-loaded Preliminary Construction Schedule is to provide a mechanism in which to measure performance on individual activities and to validate the CONTRACTOR'S monthly Application for Payment on work performed (starting with month 1) during the first three months of the job until the complete Baseline Schedule is approved by the Project Manager.
- B. CONTRACTOR shall develop and submit, through Procore, a cost loaded Preliminary Construction Schedule as required by this Section. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the CONTRACTOR'S intended sequencing of the Work. CONTRATOR shall set dates and times for working meetings with Project Manager to review the Preliminary Construction Schedule. The Preliminary

Construction Schedule shall include activities for the first 90 calendar days following the NTP such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and detailed construction activities.

- C. Upon Project Manager's acceptance of the Preliminary Construction Schedule, CONTRACTOR shall update the accepted Preliminary Construction Schedule each month (beginning with month 1) and submit these updates until CONTRACTOR'S Baseline Schedule is fully developed and accepted. Since updates to Preliminary Construction Schedule are the basis for payment to CONTRACTOR during the first three-month period, submittal and acceptance of such updates shall be a condition precedent to making of monthly payment, as referenced in General Conditions.
- D. Provide a written narrative describing CONTRACTOR'S approach to mobilization, procurement, and construction during the first 90 calendar days including crew sizes, equipment and material delivery, site access, submittals, and permits.
- E. Submit Bar Charts, Tabular Reports, a Cost flow Histogram, Electronic Data, and Plots in accordance with Section 013210 Construction Schedule.
- 3.03 SCHEDULE OF VALUES
  - A. CONTRACTOR shall cost load activities in the Preliminary Construction Schedule and allocate costs to the cost accounts of all activities. The cost accounts shall match the CSI subsections listed in the Table of Contents of the Specifications. The format shall be coordinated with Article 8.3 (Progress Payment).
  - B. Submit a computer generated tabular report from the Preliminary Construction Schedule using the P6 scheduling software. The report shall contain the following data for each activity: Cost Account Number (by CSI subsection), Cost Account Description, Cost Account Budget, Cost to Date, Cost this Period, and Cost to complete. Total costs shall be organized and totaled by CSI subsection. This tabular report shall be the source of the data CONTRACTOR reports on the Schedule of Values.
  - C. The cost loading associated with the activities shall be based on CONTRACTOR estimates of costs that CONTRACTOR will incur performing the specific activities. If Project Manager determines that the costs are front loaded and/or the distribution of costs is unreasonable, CONTRACTOR shall revise accordingly and resubmit the Schedule of Values within five (5) days for Project Manager's review.
- 3.04 BASELINE SCHEDULE CPM NETWORK
  - A. Within thirty (30) days of the Notice to Proceed, CONTRACTOR shall submit, through Procore, a detailed Proposed Baseline Schedule that covers the entire duration of the Project. This schedule shall convey CONTRACTOR'S plan for organizing, managing, and executing the Work.

- B. The Proposed Baseline Schedule shall include activity descriptions, sequencing, logic relationships, duration estimates, cost loading by CSI subsection, resource loading, and other information as set forth in this Section.
  - 1. The Proposed Baseline Schedule shall include all Milestones stipulated in General Conditions, as well as all activities required to achieve timely completion of the Milestones.
  - 2. The Proposed Baseline Schedule shall include activities for: all construction activities, the NTP, Milestones, submittals, coordination drawings, re-submittals, procurement of materials and equipment, manufacturing, fabrication & delivery, owner furnished contractor installed items (OFCI), access restrictions, work restrictions, phased occupancy, testing, start-up, and contract closeout activities. The Proposed Baseline Schedule shall allow a period for Project Manager and ARCHITECT to review each submittal, as required by General Conditions Article 7.3 and other sections which require additional time for OWNER reviews and deferred submittal reviews by Division of State Architects (DSA).
  - 3. The Proposed Baseline Schedule shall include start and completion dates for: temporary facilities, construction of mock-ups, prototypes, samples, punch list, OWNER interfaces and furnishing of items, separate work contracts, regulatory agency approvals, and permits required for performance of the Work.
  - 4. The Proposed Baseline Schedule shall allow for all foreseeable factors and risks which affect performance of the Work. Include allowances for weather conditions, applicable laws, transportation, traffic, air quality, noise, or any other applicable regulatory requirements, regulations or collective bargaining agreements pertaining to labor.
  - 5. CONTRACTOR shall not use any float suppression techniques such as preferential sequencing or logic, special lead/lag constraints or unjustifiable over-estimating of activity durations in preparing the Proposed Baseline Schedule except that Finish No Later Than constraints are permitted for Milestones. No "Zero Free Float" constraints, No "Early" Constraints, and No "Mandatory Finish" constraints shall be utilized.
  - 6. The Proposed Baseline Schedule shall include activity durations based on the crew sizes and equipment utilization that CONTRACTOR will maintain during the Project. No activity durations shall exceed twenty (20) working days unless approved by the Project Manager. Nonconstruction activities such as procurement, fabrication, delivery, or submittal activities are exempted.
  - 7. CONTRACTOR shall include with the Proposed Baseline Schedule a written narrative report sufficiently comprehensive to explain the rationale behind CONTRACTOR'S approach to the Work including but not limited to: activity durations, manpower flow, average crew sizes, equipment requirements, production rates, constraints, holidays and other non-work days, potential problem areas, permits, coordination with regulatory

authorities, utilities, separate work contracts and other parties, and long lead delivery items requiring more than thirty (40) days from the date of order to delivery to the Project site.

- C. At the Project Manager request, furnish a detailed written explanation of CONTRACTOR'S basis for specific durations, logic, phasing, or other information. Such an explanation shall include CONTRACTOR'S rationale for selecting the number of crews, crew composition, number of shifts per day, number of hours in a shift, number of work days per week, construction equipment, and/or similar factors.
- D. The Proposed Baseline Schedule activities shall contain the following data:
  - 1. Activity ID numbers shall consist of no more than eight (8) alphanumeric characters. Following Project Manager acceptance of the Baseline Schedule, Activity ID numbers shall not be changed.
  - 2. Activity Descriptions shall provide adequate information that readily identifies each activity, work scope, and location.
  - 3. Activity codes specified in section 013210-3.04-G shall be applied to each activity.
  - 4. Cost accounts (in CSI subsection format) and Resource accounts shall be applied to each activity. They shall include lump sum costs, and manhours/man-days (where applicable).
- E. At Project Manager's request, furnish a written explanation for each lead or lag relationship and each constrained date. Unjustifiable leads, lags, and constraints will result in Project Manager rejection of the Proposed Baseline Schedule.
- F. Calendar Identification: In the scheduling software, identify all activities that will require overtime shifts, double shifts, and work on weekends or holidays. Identify non-work days and holidays in the schedule calendar. All milestones stipulated in General Conditions shall be placed on a calendar with seven (7) days per week. No holiday or non work-day restrictions are permitted on this calendar.
- G. Activity Codes: As a minimum, the Activity Codes shown in the Table 1 below shall be assigned to each activity and/or be identifiable in the schedule Work Breakdown Structure (WBS).

### Table 1

Name	Length	Description
TYPE	2	Type of activity (mobilization, submittals, procurement/fabrication, construction, milestones, etc.)
AREA	2	Area and/or Building (General Conditions, Site, 1 <sup>st</sup> Floor, 2 <sup>nd</sup> Floor, Site Work, Elevators, Roof, etc.)
RESP	7	Responsible Party (subcontractor and/or trade)
SPEC	6	CSI Division and Specification number for Schedule of Values

The Project Manager may require additional coding of activities. The mandatory activity code requirements listed in Table 1 are not to be construed as setting limits on CONTRACTOR'S management and coordination responsibilities, but are intended to guide CONTRACTOR in the administration of its contractual responsibilities.

- H. Milestones are designated dates as set forth in General Conditions in which Work or portions thereof are required to start and/or complete in accordance with the Contract Documents.
  - 1. Where the term completion or similar terms are used in regards to a Milestone, it shall be construed to mean all portions of the Work in the indicated phase, area, and/or zone are complete and acceptable to Project Manager. Where the term start or similar terms are used in the designation of a Milestone, it shall be construed to mean a portion of the Work in the indicated phase, area, and/or zone is required to be commenced.
  - 2. A Proposed Baseline Schedule extending beyond the Milestones and/or Contract Time will not be acceptable.
  - 3. Finish Milestones shall be constrained with Late Finish (Finish No Later Than) type constraints in accordance with the dates stipulated in General Conditions.
  - 4. In the scheduling software, in the "Project Overview" menu, assign the "Finish on or Before" " date to match the Substantial Completion and Contract Completion Milestone dates stipulated in General Conditions.
  - 5. A Proposed Baseline Schedule indicating Work completed in less time than the Milestones and/or Contract Time will not be acceptable. Rather, CONTRACTOR shall show any unused contract time as float.
  - 6. Milestones shall be placed on a calendar with seven (7) days per week No Holiday or non work-day restrictions are permitted on this calendar.
  - 7. Schedule shall also include work milestone activities including, but not limited to: Demolition Complete, Foundation Complete, Sitework Complete, Elevator Complete, Building Weather Tight, Electrical Equipment Energized.
- I. The Critical Path shall be clearly indicated on all schedules submitted. An activity is defined as critical when its Total Float is less than or equal to zero (0) days. The critical path is defined as the longest path.

J. CONTRACTOR shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" as the last activity prior to the Substantial Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be based on Table #2 below, and will be calculated from the Notice to Proceed until the original date of Substantial Completion.

Table 2: Cumulative Calendar Days "Rain Day Impact Allowance": ThisProject will have a total of twenty (20) Rain days for the duration of the<br/>Construction.

When inclement weather at the Project site impacts Critical Path activities, CONTRACTOR may provide the Project Manager with a written request for a weather impact day describing the inclement weather delay on the Critical Path activities. The inclement weather delay must be clearly indicated by a 70% decrease in the field labor workforce hours on Critical Path activities on the day in question as indicated by CONTRACTOR'S Daily reports from the day in question and the scheduled work days prior to the day in question. Upon the Project Manager's independent confirmation of the amount of rainfall and impact, Project Manager will authorize CONTRACTOR to reduce the duration of the Rain Day Impact Allowance by one (1) day.

Inclement weather on non-scheduled workdays shall not be granted as weather impact days. If CONTRACTOR asks to work a specific weekend or holiday and gives Project Manager advanced, written notification of critical path work to be performed and a substantial amount of precipitation occurs that prevents the work from being performed, then that day can be claimed as a weather impact day. If the effects of inclement weather from a non-scheduled work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by weather. Any unused rain day allowance at the end of the project will be shown as available float to the Substantial Completion Milestone. Excusable, non-compensable time extensions will be granted for inclement weather to Substantial Completion milestone only after the weather impact area affecting the critical path work has exhausted the allotted cumulative Rain Day Impact Allowance.

- K. Cost loaded Activities:
  - 1. Each activity included in the Proposed Baseline Schedule shall be assigned the cost CONTRACTOR estimates it will incur performing that activity. Each activity's assigned cost will be inclusive of overhead and profit so CONTRACTOR'S total overhead and profit is distributed over all activities on a pro rata basis. The sum of the costs assigned to activities shall equal the total contract value. No activity costs shall be assigned to manufacturing or delivery activities unless approved by Project Manager. If the Project Manager finds that the costs are front loaded and the distribution of costs is unreasonable, CONTRACTOR shall re-distribute the costs and resubmit the revised Schedule of Values within five (5) days for The Project Manager back check.
  - 2. CONTRACTOR shall cost load activities in the Proposed Baseline Schedule and allocate costs to related resource/cost accounts associated with each activity. The cost accounts shall match the CSI subsections

listed in the Table of Contents of the Specifications. All cost-loaded activities shall roll-up to their designated CSI subsections and shall be the basis for the data reported in the Schedule of Values.

- 3. Submit computer generated tabular reports using the scheduling software which will be the basis for the approved Schedule of Values. The reports shall contain the following data for each activity: Cost/Resource Account Number (by CSI subsection), Cost/Resource Account Description, Cost/Resource Account Budget, Material Quantities and Unit Costs, Cumulative Quantities and Cost to Date, Material Quantities and Cost this Period, and Estimated Material Quantities and Cost at Completion. Total Material Quantities and Total Costs shall be organized and totaled by CSI subsection.
- 4. Submit a Cost Flow Histogram in accordance with specification Section 013210, 3.04-L-3.
- L. CONTRACTOR shall submit computer generated reports and plots with the Proposed Baseline Schedule submittal package. Format shall display the following columns: Activity ID, Activity Description, Original Duration, Remaining Duration, Percent Complete, Early Start, Early Finish, Late Start, Late Finish, and Total Float.
  - 1. Bar charts shall be generated separately for:
    - a. Milestones only.
    - b. All activities sorted by Early Start date and organized by Project, Area, Stage, & Sub-stage. (The network shall show continuous flow of all activities from left to right).
    - c. All activities sorted by Responsibility.
    - d. Summary level of all activities sorted by craft/trade and area.
  - 2. Tabular Reports:
    - a. Total Float sorted low to high.
    - b. Predecessors and Successors sorted by Activity ID.
  - 3. Cost Flow Histogram
    - a. Using the costs assigned to each activity, develop a Histogram that projects the estimated invoice amounts by month for the Project duration. The histogram shall be produced from the scheduling software on 11x17 size paper (landscape mode). It shall contain both a monthly bar histogram and a cumulative cost curve on the same graph. The Total Costs shall be based on the Early Dates option.

- 4. Man Power Histogram
  - a. Submit a planned man-power graphic bar histogram produced from the scheduling software on 11x17 size paper (landscape mode) that displays total man-hours based on Early Dates. Show both a weekly bar histogram and a cumulative curve on same graph. Upon the Construction Manger request, provide manpower broken down by trade.
- 5. Provide a written narrative as required by Section 013210-3.04-B-7.
- 6. Electronic data: Provide electronic P6 files in ".XER" type format.
- Project Manager will notify CONTRACTOR of any adjustments that are required Μ. for the Proposed Baseline Schedule to be accepted. CONTRACTOR shall perform any required adjustments to the Proposed Baseline Schedule and resubmit it for acceptance certifying in writing that all information contained therein complies with the Contract Documents. The Project Manager will review the Proposed Baseline Schedule for accuracy, reasonableness, and conformance with the Contract Documents and shall provide comments within ten (10) days of receipt. Within five (5) days after receiving Project Manager comments, CONTRACTOR shall both incorporate changes to address Project Manager concerns and resubmit the Proposed Baseline Schedule for Project Manager back-check. This process will continue until the Proposed Baseline Schedule is accepted as the Baseline Schedule. Once accepted by Construction Manger, the Baseline Schedule will be the basis upon which CONTRACTOR shall prepare updates that record and report actual performance and progress. The accepted Baseline Schedule and subsequent Monthly Updates (reference Section 013210 - 3.04 and 3.05 respectively) shall be the basis for consideration and analysis of requests for time extensions and CONTRACTOR progress payments.
- N. Project Manager acceptance of the Baseline Schedule or CONTRACTOR'S failure to identify and/or include any element of the Contract, shall not release CONTRACTOR'S obligation to complete all required Work in accordance with the Contract Documents.

### 3.05 REQUIREMENTS FOR MONTHLY/WEEKLY SCHEDULE UPDATING

- A. Once the Baseline Schedule is accepted by Project Manager, CONTRACTOR shall submit Monthly Schedule Updates beginning with month No. 1. The current month's schedule update cannot be accepted until the previous Monthly Schedule Update has been accepted by Project Manager.
- B. Monthly Schedule Update Format
  - 1. Initially, the Contractor shall status a current Monthly Schedule Update with actual Work progress only. No logic ties shall be modified. Status all Actual Start and Finish dates, adjust Remaining Durations where needed, and update Percent Completion of cost and resource loaded activities. No activity Original Durations or Logic shall be changed unless authorized

by Project Manager. No new activities shall be added unless authorized by the Project Manager.

- 2. Once the schedule is status in accordance with Section 013210-3.05-B1, CONTRACTOR shall print (and submit with Monthly Schedule Update) a report of "out-of-sequence" logic that results from the updating process. CONTRACTOR shall then correct all "out-of-sequence" logic to reflect CONTRACTOR'S actual Work sequence. If CONTRACTOR chooses to modify logic or add activities (other than out-of-sequence corrections), it shall be done in accordance with Section 013210-3.07 (Fragnets & Time Extensions Request).
- 3. During construction, CONTRACTOR may desire to break down specific activities into greater detail. If greater detail is necessary, then CONTRACTOR shall identify expanded activities such that the Baseline Schedule activities that the expanded activities originated from are readily apparent. CONTRACTOR shall not allow the aggregate duration of the expanded activities to exceed the duration assigned to the Baseline Schedule activity unless permitted by Project Manager in writing.
- 4. Autocost rules shall link Remaining Duration and Percent Complete.
- 5. The Data Date for the Monthly Schedule Updates shall be the last day of the month. At a minimum, three (3) days prior to the submission of the Monthly Schedule Update, CONTRACTOR shall meet in person with Project Manager to present the proposed Percentages of Completion and Actual Start and Actual Finish dates. Once percentages of completion and actual dates have been agreed to, they shall be the basis of the Monthly Schedule Update.
- 6. CONTRACTOR shall submit a Manpower Histogram that overlays a planned curve from the Baseline Schedule and a planned curve from the current Monthly Schedule Update.
- 7. Written Narrative Report: CONTRACTOR shall include a written report to explain the Monthly Schedule Update. The narrative shall, at a minimum include the following headings with appropriate discussions of each topic:
  - a. Introduction
  - b. A Summary of Work which was on-going This Pay Period
  - c. Problem Areas and Proposed Solutions
  - d. Critical Path
  - e. Current and Anticipated Delays
  - f. Coordination of Work with Others
  - g. Milestone Status

- 8. In updating the Schedule, CONTRACTOR shall not modify Activity ID numbers, schedule calculation rules/criteria, or the Activity Coding Structure required.
- 9. Submit bar charts, tabular reports, a cost flow histogram, man-power histogram, written narrative, electronic data, and plots in accordance with Specification Section 013210-3.04-L.
- 10. Submit a cost-loaded report (progressed monthly) produced from the scheduling software that displays all of the activities organized by the CSI subsection cost/resource accounts. This report shall be in compliance with Section 013210-3.04-K, Section 012973 (Schedule of Values) and Section 012900 (Payment Procedures).
- C. Three-Week Look Ahead Schedule: At each Weekly Progress Meeting, CONTRACTOR shall present a Three-Week Schedule in Bar Chart format. It shall show one (1) week of actual and three (3) weeks of forecasted progress. The Three-Week Rolling Schedule shall be used as a basis for discussing progress and work planned during the three (3) weeks.
  - 1. The Three-Week Look Ahead Schedule shall be based on the most recent Project Manager Accepted Monthly Schedule Update. It shall include weekly updates to all construction, submittal. fabrication/procurement, separate work activities. and contract CONTRACTOR shall ensure that it accurately reflects the current progress of the Work.
  - 2. CONTRACTOR shall discuss actual dates and any variances to critical or near critical activities.
  - 3. Upon request by Construction Manager, CONTRACTOR shall provide the Three-Week Look Ahead Schedule in electronic format.
  - 4. If the Three-Week Look Ahead Schedule indicates activities are behind schedule, CONTRACTOR shall provide a Recovery Schedule in accordance with Section 013210-3.06.

# 3.06 RECOVERY SCHEDULES

- A. If a Monthly Schedule Update indicates negative float greater than ten (10) days on a critical path as result of events not predicated by Article 7.4 of the General Conditions CONTRACTOR shall prepare a Proposed Recovery Schedule demonstrating CONTRACTOR'S plan to regain the time lost. The Recovery Schedule shall be submitted either in advance of or concurrent with the Monthly Schedule Update and CONTRACTOR progress request. Both the Monthly Schedule Update and the Proposed Recovery Schedule shall be based on the same percentages of completion and actual dates accepted by Project Manager under Section 013210 – 3.05 B (Monthly Schedule Update Format).
- B. The Proposed Recovery Schedule shall be based on a copy of the Monthly Schedule Update for the calendar month during which the negative float first appears.

- C. The Proposed Recovery Schedule shall include a narrative that identifies the causes of the negative float on the critical path and provides CONTRACTOR'S proposed corrective action to ensure timely completion of all Milestones and the Substantial Completion Date. CONTRACTOR'S corrective actions shall include but are not limited to increasing concurrent operations, increasing labor, adding multiple shifts in a 24-hour period, and adding overtime.
- D. During any period of time when CONTRACTOR is found to be behind schedule by Project Manager, the Monthly Schedule Update described in Section 013210 – 3.05 shall become a weekly requirement to provide a greater degree of focus on the timely completion of the Work. These Updates shall be submitted to Project Manager every Monday morning. When CONTRACTOR is deemed by the Project Manager to be back on schedule, CONTRACTOR may revert to submitting the schedule monthly.
- E. CONTRACTOR'S progress payment may not be processed until the Project Manager accepts the Proposed Recovery Schedule. Following such an acceptance, the Proposed Recovery Schedule will be known as the Recovery Schedule and future Work will be performed by CONTRACTOR in accordance with it.

# 3.07 FRAGNETS & TIME EXTENSION REQUESTS

A. Float is not for exclusive use or benefit of either OWNER or CONTRACTOR but is an expiring resource available to both parties on a non-discriminatory basis. If required to meet specified Milestones, either party may utilize float. Adjustments to Milestones and/or Contract Time will only be authorized by Change Order and only to the extent the claimed adjustments exceed total float along the most critical path of the current Monthly Schedule Update in effect at the time of the claimed adjustments. The claimed adjustments to the Milestones and/or Contract Time must also cause the Substantial Completion Date to exceed that currently indicated in the Monthly Schedule Update. CONTRACTOR claimed adjustments to an existing negative float path will not receive consideration until the activity with the highest negative float is driven even further negative.

Claimed adjustments to the Milestones and/or Contract Time will be administered in conjunction with those set forth in the General Conditions.

- B. Pursuant to the float sharing requirements of this Section, the use of float suppression techniques such as preferential sequencing or logic, special lead / lag logic restraints, and extended activity times or durations are prohibited. The use of float time disclosed or implied by the use of alternate float suppression techniques shall be proportionally shared to benefit OWNER and CONTRACTOR. The use of any technique solely for the purpose of suppressing float will result in OWNER rejection of the submitted Monthly Schedule Update.
- C. In the event CONTRACTOR believes the Project has suffered an adverse impact arising from events predicated by Article 7.4 of the General Conditions, CONTRACTOR may prepare a Time Extension Request by submitting a Schedule Fragnet and a written narrative outlining the detail of the impact. A Schedule Fragnet must demonstrate a critical path delay. Such a delay must adversely impact the Substantial Completion Date for CONTRACTOR to receive

a time extension. To demonstrate such an impact successfully, CONTRACTOR shall prepare a Schedule Fragnet based on a copy of OWNER accepted Monthly Schedule Update for the calendar month during which the adverse impact occurred. This "copy" of the OWNER accepted Monthly Schedule Update shall however first be updated (by OWNER and CONTRACTOR jointly) with both Percentages of Completion and Actual Dates up to the day the delay commenced. This process will provide the "pre-delay" project status. Once OWNER and CONTRACTOR have agreed to the "pre-delay" project status, CONTRACTOR should make a copy of this "pre-delay" schedule and this copy is to be the starting point for CONTRACTOR'S Schedule Fragnet development. OWNER will evaluate the activities, logic, durations, etc... in the Schedule Fragnet and will evaluate if the adverse impact arose from events described by Article 7.4 of the General Conditions. The Fragnet shall also include CONTRACTOR-caused delays that affect the critical or near critical path in the network and should be accounted for in the Time Impact Analysis if overlapped at any point in time with OWNER-caused delay. If rain impact days were granted between the Start and Finish of OWNER-caused delay period, they should be accounted for in the Time Impact Analysis as well. Provided OWNER determines such an impact occurred, CONTRACTOR may be due a time extension equal to the number of proportioned days of variance/delay that resulted to the Substantial Completion Date.

- D. All activities added into a Schedule Fragnet to demonstrate the impact of adverse event shall be assigned a unique activity code. The Schedule shall be organized by this unique activity code.
- E. The Schedule Fragnet shall incorporate logic that accurately ties reflective of the adverse event to pre-event predecessor activities and post event successor activities.
- F The format and components of a Schedule Fragnet submittal shall be in accordance with Section 013210 and Article 7.4 of the General Conditions. It is crucial for the Fragnet to be submitted within the same month of discovery so it can be resolved during the monthly schedule update review. The notice shall be transmitted to Project Manager within the stipulations outlined in Article 9 of the General Conditions.
- G. If OWNER accepts CONTRACTOR'S Schedule Fragnet and an extension is granted, a Change Order will be prepared. OWNER will advise what change order number the time extension will become. When CONTRACTOR receives this Change Order number, all the activities added to the Schedule Fragnet shall be given Activity Identification Numbers that corresponds with the Change Order number. CONTRACTOR shall cost load and resource-load the activities if required by OWNER. If resource loading is required, the resource loading shall include a breakdown of labor, material, and equipment quantities.
- H. If OWNER rejects CONTRACTOR'S Schedule Fragnet in part based on improper forecast logic or activity tasks then it shall be revised accordingly to conform to the OWNER'S review comments and resubmitted. If the forecast logic and activity tasks cannot be agreed to then the pre-delay schedule outlined in Section 013210-3.07-C shall be compared to the actual as-built data in the succeeding month of the encountering issue, event, condition, circumstance, and/or cause.

The variance to the project between the pre-delay and post delay schedules shall be discussed in CONTRACTOR'S written narrative and proportioned between the different parties involved in the delay.

- I. If OWNER rejects CONTRACTOR'S Schedule Fragnet in whole then CONTRACTOR may follow the procedures set forth in Article 16 of the General Conditions.
- 3.08 PAYMENT FOR SCHEDULING
  - A. The Work in Section 013210 will be included as part of the bid price.
  - B. Preparation, revising, maintenance, and compliance with Section 013210 is an integral part of the Contract Documents and is specified to have a minimum value equal to 2% of the original Contract Amount or \$150,000, whichever is less. This amount shall be cost loaded into an activity titled "Construction Schedule" in both the Proposed Baseline Schedule and the Schedule of Values described in Section 012973.
    - 1. CONTRACTOR may bill twenty percent (20%) of the amount cost- loaded in the "Construction Schedule" activity when the Project Manager accepts the Proposed Baseline Schedule as the Baseline Schedule.
    - 2. The remaining eighty percent (80%) may be billed in equal monthly increments. The amount of those increments is determined by dividing the remainder of the amount cost-loaded in the "Construction Schedule" activity divided by the total number of months in the Contract Time. Payment of these incremental amounts is contingent upon Project Manager acceptance of CONTRACTOR Monthly Schedule Updates, Recovery Schedules, Three-Week Look Ahead Schedule and the updated Log of Required Submittals.

# 3.09 FAILURE TO COMPLY WITH REQUIREMENTS

- A. At any time during the project if CONTRACTOR fails to comply with the specified requirements, OWNER reserves the right to engage independent estimating and/or scheduling consultants to fulfill these requirements. Upon notice to CONTRACTOR, OWNER shall assess against CONTRACTOR, all incurred costs for these additional services.
- Β. In such an event, OWNER will require, and CONTRACTOR shall participate and provide all requested and/or required information to ensure the resulting Milestones Schedule accurately reflects CONTRACTOR plan to execute the Work in compliance with the Contract Documents. If it becomes necessary for OWNER to recommend logic and/or duration revisions as a result of CONTRACTOR failure to furnish acceptable data, and if CONTRACTOR has objections to the recommendations, CONTRACTOR shall provide notice to OWNER within three (3) days and CONTRACTOR shall provide an acceptable alternate plan. If CONTRACTOR fails to so note any objections and provide an if CONTRACTOR acceptable alternate plan, or implements the recommendations of OWNER without so noting any objections, CONTRACTOR

will be deemed to have waived all objections and concurred with the recommended logic/duration revisions provided by ARCHITECT and/or OWNER.

- C. Submittal of any Monthly Schedule Updates is subject to review and acceptance by OWNER. OWNER retains the right, including, but not limited to Article 8 of the General Conditions, to withhold progress payments in whole or part until CONTRACTOR submits a Monthly Schedule Update acceptable to OWNER.
- 3.10 CONTRACTOR RESPONSIBILITY
  - A. Nothing in this Section shall be construed to be a usurpation of CONTRACTOR authority, responsibility, and obligation to plan and schedule Work as CONTRACTOR deems necessary, subject to all other requirements of the Contract Documents.
  - B. CONTRACTOR shall involve the subcontractors, manufacturers, and suppliers in the development and periodic updating of the schedule.
- 3.11 RECORD DOCUMENTS
  - A. Prior to Contract Completion of the Work, CONTRACTOR shall submit, through Procore, an as-built time-scaled network diagram reflecting the actual dates of all activities.

END OF SECTION 013210

# SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Preconstruction videos.
  - 4. Periodic construction videos.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting photographic documentation.
  - 2. Division 2 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.
  - 3. Division 1 Section "Demonstration and Training" for submitting videos of demonstration of equipment and training of Owner's personnel.

### 1.3 SUBMITTALS

- A. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
  - 1. Format: Submit a complete set of digital image electronic files with each submittal of prints on CD-ROM, or other electronic storage device. All photos shall be uploaded to Procore within the Contractor's Photographs folder. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, un-cropped. Pictures within the CD-ROM should have reference to the following information.
    - a. Name of Project.
    - b. Name of Construction Manager.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken if not date stamped by camera.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

- g. Unique sequential identifier.
- B. Digital Video: Submit two copies of each digital video with protective sleeve or case within seven days of recording. Remove safety tab to prevent accidental re-recording.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Construction Manager.
    - d. Name of Architect.
    - e. Name of Contractor.
    - f. Date video was recorded.
    - g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - h. Weather conditions at time of recording.

# PART 2 - PRODUCTS

- 2.1 PHOTOGRAPHIC MEDIA
  - A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.
  - B. Digital Video Format: Provide high-quality, high definition color digital video at an image resolution of not less than 1920 x 1080 pixels.
    - 1. Video quality shall be adequate to create photographic prints to be made from individual frames.

### PART 3 - EXECUTION

- 3.1 GENERAL
  - A. Contractor shall document preconstruction conditions using photographs or video, including condition of underground utilities, as required. All site documentation photos shall be uploaded to the Contractor's Site Documentation folder within Procore.
  - B. Contractor may use photographs or video.

# 3.2 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in filename for each image.
  - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, and starting construction, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.
  - 1. Flag excavation areas and construction limits before taking construction photographs.
  - 2. Take photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of Work.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
  - 5. Show protection efforts by Contractor.
- D. Monthly Construction Photographs: Take color, digital photographs to show existing conditions uncovered as work progresses. Select vantage points to show status of construction and progress since last photographs were taken.

# 3.3 CONSTRUCTION VIDEOS

- A. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  - 2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.
- B. Preconstruction Video: Before commencement of excavation, commencement of demolition, and starting construction, record video of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.

- 1. Flag excavation areas and construction limits before recording construction videos.
- 2. Show existing conditions adjacent to Project site before starting the Work.
- 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of Work.
- 4. Record additional video as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- 5. Show protection efforts by Contractor.
- C. Monthly Construction Videos: Record video to show existing conditions uncovered as work progresses. Select vantage points to show existing construction or condition, status of construction and progress since last video was taken.

END OF SECTION 013233

# SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 – GENERAL

### 1.1 SUMMARY

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

# 1.2 RELATED SECTIONS

- A. General and Special Conditions
- B. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
- C. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
- D. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
- E. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.

# 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Project Manager's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require College Project Manager's responsive action. Submittals may be rejected for not complying with requirements.

### 1.4 QUALITY ASSURANCE

- A. Perform no portion of Work requiring an Action Submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until respective Action Submittal has been approved by Architect/Engineers of Record and reviewed by College Project Manager. All Work shall be in accordance with Accepted/Accepted As Noted Submittals.
- B. Contractor shall not be relieved of its sole responsibility for deviations from requirements of Contract Documents by review or acceptance by College Project Manager of Shop Drawings, Product Data, Samples or similar Submittals.
- C. Contractor shall not be relieved of its sole responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar Submittals by College Project Manager's review thereof.
- D. Direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar Submittals, to revisions (other than those requested by College Project Manager on previous Submittals).
- E. Informational Submittals upon which College Project Manager is not expected to take responsible action may be so identified in Contract Documents.

- F. When professional calculations or certification of performance criteria of materials, systems or equipment is required by Contract Documents, District and College Project Manager shall be entitled to rely upon accuracy and completeness of such calculations and certifications.
- G. Submittals may be rejected for not complying with requirements of Contract Documents.

# 1.5 SUBMITTAL SCHEDULE

- A. Submittal Schedule. Ten (10) days prior to starting construction at the site, the Contractor shall prepare and submit, within Procore and in accordance with the Contract Documents, a Submittal Schedule. The Submittal Schedule shall be coordinated with the Contractor's Construction Schedule and allow the College Project Manager such time for review of Submittals as may be required by the Contract Documents, or if none is required, an average time of 21 days for such review. The Contractor shall keep the Submittal Schedule current and updated in accordance with the requirements of the Contract Documents.
  - 1. Coordinate Submittal Schedule with Work of Sub-contractors, Schedule of Values and list of products, as well as Contractors Construction Schedule.
- B. Include scheduled activities for all Fabrication, BIM Models, Shop Drawings, Product Data, Samples and similar Submittals, including without limitation, coordination drawings, and certificates of compliance, manufacturer's certificates, warranties, operations and maintenance manuals, attic stock (extra Material), demonstration and training (including video documentation), as-built plans, transfer of keys, and all other types of documents that are required to be submitted by Contractor under the Contract Documents.
- C. Coordinate preparation of Submittal Schedule with College Project Manager, allowing more than 21 days of review time for complicated or lengthy Submittals and less time than 21 days for those less complicated and less lengthy Submittals. Allow time for separate review by Architect/Engineer of Record prior to submittal to review by College Project Manager.
- D. Schedule Submittals to avoid concurrent Submittals to maximum extent possible.
- E. Where Submittal is concurrent with or overlaps Submittals currently being reviewed, indicate priority of each outstanding Submittals.
- F. Prepare schedule in chronological order. Provide following information:
  - 1. Schedule date for first Submittal.
  - 2. Related Section number.
  - 3. Submittal category.
  - 4. Name of Sub-contractor.
  - 5. Description of part of Work covered.
  - 6. Scheduled date for re-submittal.
  - 7. Number of Contractor's shop drawings, coordination drawings or other drawings anticipated within each submittal.
  - 8. Review time by Contractor's team, prior to submission to College Project Manager.
- G. Distribution of Submittal Schedule: Following comments resulting from College Project Manager's response to initial submission, print and distribute copies to College Project Manager, Contractor's team, Sub-contractors, and other parties required to comply with Submittal dates indicated.
  - 1. Post copies in Project meeting room and temporary field office.

- 2. When additional revisions are made, distribute to same parties and post in same locations. Delete parties from distribution when they have completed their assigned part of Work and are no longer involved in construction activities.
- 3. Adhere to accepted schedule except when specifically otherwise permitted.
- H. Schedule Updating: Revise Submittal Schedule every month and after each meeting or other activity where revisions have been recognized or made. Issue updated Submittal Schedule concurrently with report of each meeting.

# 1.6 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Digital Data Files: Electronic copies of digital files of the Contract Drawings will be provided and/or produced by Contractor and Sub-Contractors for use as background only in preparing submittals. Current drawings can also be found in the Drawings tool of Procore.
  - 1. Contractor shall use Digital CAD files and drawings for submission of shop drawings.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. College Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for reviews by College Project Manager and applicable District's Manager's receipt of submittal. No extension of the Contract time will be authorized because of failure to transmit submittals enough in advance of the Work to permit reasonable processing, including re-submittals.
  - Initial Review: Allow an average review time of 21 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. College Project Manager will advise Contractor when a submittal is being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate review is necessary, process it in the same manner as initial submittal.
  - 3. Re-submittal Review: allow an average review time of 14 days for review of each resubmittal.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
  - 2. Provide a space approximately 6 by 8 inches (150) by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by College Project Manager.
  - 3. Include the following information for processing and recording action taken:
  - a. Project name.
  - b. DSA Approval Number.

- c. Date.
- d. Name of Architect/Engineers of Record.
- e. Name of College Project Manager.
- f. Name of Contractor.
- g. Name of Sub-contractor.
- h. Name of supplier.
- i. Name of manufacturer.
- j. Submittal number or other unique identifier, including revision identifier.
  - 1. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g. 06100.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01A).
- k) Number and title of appropriate Specification Section.
- I) Drawing number and detail references, as appropriate.
- m) Location(s) where product is to be installed, as appropriate.
- n) Other necessary identification.
- 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless College Project Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

a. If, in addition to review by College Project Manager, the Submittal is being reviewed concurrently by other District Consultants, submit one copy of submittal to each concurrent reviewer in addition to specified number of copies to College Project Manager.

- 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. College Project Manager will return without review submittals from sources other than Contractor.
  - a. On attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by College Project Manager on previous Submittals, and deviations from requirements of Contract Documents, including minor variations and limitations. Include same label information as related Submittal.
  - b. Include Contractor's certification stating that information submitted complies with requirements of Contract Documents.
  - c. Transmittal Form: Use sample form provided by college Project Manager.
  - d. Transmittal form for Paper Submittals: Provide locations on form for the following information:
    - 1. Project name.
    - 2. DSA Approval Number.
    - 3. Date.
    - 4. Destination (To:).
    - 5. Source (From:).
    - 6. Name and address of Architect/Engineers of Record.
    - 7. Name of College Project Manager.

- 8. Name of Contractor.
- 9. Name of firm or entity that prepared submittal.
- 10. Names of Sub-contractor, manufacturer, and supplier.
- 11. Category and type of submittal.
- 12. Submittal purpose and description.
- 13. Specification Section number and title.
- 14. Specification paragraph number or drawing designation and generic name for each of multiple items.
- 15. Drawing number and detail references, as appropriate.
- 16. Indication of full or partial submittal.
- 17. Transmittal number, numbered consecutively.
- 18. Submittal and transmittal distribution record.
- 19. Remarks.
- 20. Signature of transmitter.
- E. Electronic Submittals: Where required per paragraph 1.6.A above. Identify and incorporate information in each electronic submittal file as follows:
  - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - 2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01A).
  - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by College Project Manager.
  - 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to College Project Manager, containing the following information:
    - a. Project name.
    - b. DSA Approval Number.
    - c. Date.
    - d. Name and address of Architect/Engineers of Record.
    - e. Name of College Project Manager.
    - f. Name of Contractor.
    - g. Name of firm or entity that prepared submittal.
    - h. Names of Sub-contractor, manufacturer, and supplier.
    - i. Category and type of submittal.
    - j. Submittal purpose and description.
    - k. Specification Section number and title.
    - I. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - m. Drawing number and detail references, as appropriate.
    - n. Location(s) where product is to be installed, as appropriate.

- o. Related physical samples submitted directly.
- p. Indication of full or partial submittal.
- q. Transmittal number, numbered consecutively.
- r. Submittal and transmittal distribution record.
- s. Other necessary identification.
- t. Remarks.
- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from Contract Documents on Submittals clearly designating those portions as deviating from the Contract Documents and include separate written notification.
- G. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmissions are subject to same terms and conditions as original Submittal.
  - 4. Should more than 1 resubmission be required, Contractor may, at the sole discretion of the District, reimburse District for time spent by College Project Manager, District Consultants or other reviewers in processing additional resubmissions at either the agreed rates as established by contract, or if none is established, at the rate of 2.5 times the reviewer's Direct Personnel Expense (DPE). For purposes of this Paragraph, "Direct Personnel Expense: is defined as direct salaries of the reviewer's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contributions and benefits.
  - 5. Resubmit submittals until they are marked with approval notation from Architect/Engineers of Record's and College Project Manager's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, Sub-contractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect/Engineers of Record's and "Accepted or Accepted As Noted" from College Project Manager.
  - 1. Fabrication Models shall be visually presented to College Project Manager demonstrating full coordination with other systems prior to use for fabrication and installation.

PART 2 – PRODUCTS

# 2.1 SUBMITTAL PROCEDURES

- 1. General Submittal Procedure Requirements:
  - a. General Contractor to submit all submittals electronically and store all submittals in a cloud based storage system for the duration of the project.
  - b. College Project Manager will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - c. Markups and screen captures shall be included within the provided fabrication models, where appropriate.
- 2. Action Submittals: For Product Data, Shop Drawings and Samples, and other actions requiring review by the College Project Manager. Submit seven copies of each submittal unless otherwise indicated.
  - a. If additional copies are needed for distribution to District Consultants or others not listed below, they shall be provided as required by the Contract Documents or as requested by College Project Manager.
  - b. College Project Manager will, upon initial receipt of a submission or resubmission of a Submittal, retain 5 copies and forward 1 copy to the Program Manager.
  - c. College Project Manager will, following review and action by reviewers on a submission or resubmission of a Submittal, distribute signed and stamped copies as follows: 1 to CPM, 1 to Program Manager, 1 to Inspector of Record and 2 to Contractor.
  - d. Contractor shall retain returned copy as Record Document and using it prepare copies for distribution to Sub-Contractor.
- 3. Informational Submittals: for submittals not requiring responsive action by the College Project Manager and other action required by Specifications. Submit three paper copies of each submittal unless otherwise indicated. College Project Manager will not return copies.
- 4. Certificates and Certifications Submittals: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
  - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- 5. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - a. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - b. Mark each copy of each submittal to show which products and options are applicable.
  - c. Include the following information, as applicable:
    - 1) Manufacturer's catalog cuts.
    - 2) Manufacturer's product specifications.
    - 3) Manufacturer's installation instructions.
    - 4) Mill reports.
    - 5) Standard product operating and maintenance manuals.

- 6) Manufacturer's written recommendations.
- 7) Manufacturer's standard product warranty.
- 8) Standard color charts.
- 9) Statement of compliance with specified referenced standards, and recognized trade association standards.
- 10) Testing by recognized testing agency.
- 11) Application of testing agency labels and seals.
- 12) Approval numbers of organizations or agencies as required by Governmental authorities having jurisdiction.
- 13) Notation of dimensions verified by field measurement.
- 14) Notation of coordination requirements.
- 15) Availability and delivery time information.
- 16) Complete training demonstration video: Prepare electronic version in a format satisfactory to the District of all training demonstrations.
- 17) Inventory Listing: Inventory of tools, spare parts, extra material, keys, and similar items.
- 18) Manuals: Operations & Maintenance (O&M) manual, Warranties manual, Extended Warranties manual (if applicable), other demonstration and training documents including demonstration and training video documentation.
- d. For equipment, include the following in addition to the above, as applicable:
  - 1) Wiring diagrams showing factory-installed wiring.
  - 2) Printed performance curves.
  - 3) Operational range diagrams.
  - 4) Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- e. Submit Product Data before or concurrent with Samples.
- C. Shop Drawings: Prepare Project-specific information, drawn or modeled accurately to scale. Use reproductions of the contract Documents or standard printed data as background only for insertion of specific data and design required by each trade.
  - 1. Preparation: Fully illustrate requirements in the Contract documents. Include the following information, as applicable:
    - a. Identification of Products.
    - b. Dimensions.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Design calculations.
    - i. Schedules.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.

- I. Notation of dimensions established by field measurement.
- m. Notation of as-built conditions.
- n. Relationship and attachment to adjoining construction clearly indicated.
- o. Seal and signature of professional engineer if specified.
- 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that include the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
  - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  - 4. Disposition: Maintain sets of approved Samples at Project site, available for qualitycontrol comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the work, or otherwise designated as Owner's property, are the property of Contractor.
  - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
  - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - 7. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect of Record's exemplar where so indicated. Attach label on unexposed side that includes the following:
    - a. Generic description of Sample.
    - b. Product name or name of manufacturer.

- c. Sample source.
- 8. Additional Information: On attached separate sheet, prepared on Contractor's letterhead, provide the following:
  - a. Size limitations.
  - b. Compliance with recognized standards.
  - c. Availability.
  - d. Compliance with Applicable Laws.
  - e. Statement of acceptable uses or statement indicating suitability of product specified for proposed use.
  - f. Delivery time.
- 9. Submit Samples for review of kind, color, pattern, and texture for final check of these characteristics with other elements and for comparison of these characteristics between final Submittal and actual component as delivered and installed.
  - a. If variation in color, pattern, texture, or other characteristic is inherent in product represented by Sample, submit at least 3 sets of paired units that show approximate limits of variations.
  - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
- 10. Disposition: Maintain sets of approved Samples at Project site, available for qualitycontrol comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  - a. Samples that may be incorporated into Work are indicated in individual Specification Sections. Such Samples must be in undamaged condition at time of use.
  - b. Samples not incorporated into Work, or otherwise designated as District's property, are property of Contractor.
- E. Product List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product.
  - 2. Number and name of room or space.
  - 3. Location within room or space.
- F. Coordination Drawings Submittals: Comply with requirements specified in General Conditions.
- G. Contractor's Construction Schedule: Comply with requirements specified in General Conditions.
- H. Application for Payment and Schedule of Values: Comply with requirements specified in General Conditions.
- Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of work, including those who are to furnish products or equipment fabricated to special design. Use CSI Form 1.5A or other form acceptable to College Project Manager. Include following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.

- 2. Number and title of related Specification Sections covered by subcontract.
- 3. Drawing number and detail references, as appropriate, covered by subcontract.
- J. Test and Inspection and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- K. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- L. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- M. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Design Consultants and owners, and other information specified.
- N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- O. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- P. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the contract documents. Include evidence of manufacturing experience where required.
- Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- T. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluations of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- U. Research/Evaluation Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- W. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- X. Preconstruction Test Reports: Submit reports written by a qualified agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- Y. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Z. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- AA.Design Data: Prepare and submit written and graphic information, including, but not limited to performance and design criteria, list of applicable codes and regulations and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- BB.Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Section 017823.
- CC. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.

DD. Manufacturer's Field Reports: Prepare written information documenting factoryauthorized service representative's tests and inspections. Include following, as applicable:

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

# 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to College Project Manager.
- F. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

# PART 3 – EXECUTION

## 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review and approve each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Obtain Architect/Engineers of Record's approval and mark with approval stamp prior to submission to College Project Manager.
  - 1. Submittals that do not bear Contractor's approval stamp and Architect/Engineers of Record's approval stamp as required herein will be returned without actions.
- B. Architect/Engineers of Record's Action: Approval is for purpose of checking for conformance with the Contract Documents.
  - 1. Where action and return of Submittals is required, Architect of Record will review each Submittal, mark to indicate action taken, and return.
  - 2. Compliance with Contract Documents is Contractor's responsibility.
  - 3. Review of separate item shall not indicate acceptance of assembly of which item is part.
- G. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- H. Approval Stamp: Stamp each submittal with a uniform, approval stamp that has been reviewed and approved by Contractor. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval.

## 3.2 COLLEGE PROJECT MANAGER'S ACTION

- A. General: College Project Manager nor Architect/Engineer of Record will not review submittals that do not bear Contractor's approval stamp will return them without action.
- B. College Project Manager: Review is for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

- 1. Purpose of Submittal is to demonstrate for those portions of Work for which submittals are required, manner in which Contractor proposes to conform to information given and design concept expressed on Contract Documents.
- 2. Review is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor.
- C. Except for Submittals for record or for information, where action and return of Submittals is not required, College Project manager will review each Submittal, mark to indicate action taken, and return.
  - 1. Compliance with specified characteristics is Contractor's responsibility and is not considered part of College Project Manager's review.
  - 2. Acceptance of Submittals with deviations from the Contract Documents that have been noted in the manner required by the Contract Documents shall not relieve Contractor from its sole responsibility for additional costs and delays associated with changes required to accommodate such deviations. Deviations included in Submittals, including those that have been noted as such by Contractor, are deemed rejected and exempt from any review of Submittal by College Project Manager.
  - 3. Review of separate item shall not indicate acceptance of assembly of which item is part.
  - 4. Make those revisions required by College Project Manager.
  - 5. Notations by College Project Manager which, if implemented, would require Contractor to perform Extra Work or cause Delay shall be brought to College Project Manager's attention, in writing in the manner required by the General Conditions, before proceeding with Work.
  - 6. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, College Project Manager shall be entitled to rely upon accuracy and completeness of such calculations and certifications.
- D. Action Submittals: Architect or Engineer of Record will review each submittal, make marks to indicate acceptance, corrections or revisions required, and return it. College Project Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:
  - 1. Accepted: Means fabrication, manufacturer, or construction may proceed provided that the Submittal complies with Contract Documents.
  - 2. Accepted as Noted: Means fabrication, manufacture, or construction may proceed provided that Submittal complies with the Contract Documents and incorporates reviewer's notations. If Contractor cannot comply with such notations, Contractor shall make revisions and resubmit.
  - 3. Revise and Resubmit: Means fabrication, manufacture, or construction may NOT proceed. In resubmitting, Contractor shall limit corrections to items marked.
  - 4. Rejected: Means Submittal does not comply with expressed design intent of Contract Documents. Do not reuse Submittals stamped "Rejected." Prepare Submittal again and resubmit.
- E. Informational Submittals: College Project Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. College Project Manager will forward each submittal to appropriate party.

- F. Incomplete submittals are unacceptable, will be considered non-responsive, and will be returned for re-submittal without review.
- G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

## SECTION 013527 - SITE SAFETY

- PART 1 GENERAL
- 1.01 SECTION INCLUDES
  - A. Requirements for compliance with OSHA, Cal-OSHA, and other safety requirements

#### 1.02 JOBSITE SAFETY

- A. The Contractor shall be solely responsible for ensuring that all work performed under the Contract is performed in strict compliance with all applicable Federal, State and Local occupational safety regulations. The Contractor shall provide at its expense all safeguards, safety devices and protective equipment, and shall take any and all actions appropriate to providing a safe jobsite.
- B. A multi-employment worksite, as defined by Cal-OSHA, is one in which many employers occupy the same site. The Long Beach City College (LBCC) considers the Contractor to be the "controlling authority" for all work site safety and health of the sub-contractors.

#### 1.03 PROJECT SAFETY OFFICIAL (PSO)

- A. The Contractor shall designate in writing a Project Safety Official (PSO). The PSO must be a competent person capable of identifying existing and predictable hazards in the surroundings of working conditions which are unsanitary, hazardous, or dangerous to employees and must have previous experience on similar types of projects. The PSO shall be thoroughly familiar with the Contractor's INJURY AND ILLNESS PREVENTION PROGRAM (IIPP). The PSO shall be available at the work site at all times work is in progress to promptly abate any potential safety hazards and shall have the authority and responsibility to shut down an operation, if necessary. Failure by the Contractor to provide the required PSO or grant the PSO due authority are grounds upon which the Construction Manager may direct the cessation of all work activities and operations at no cost to LBCC until such time as the Contractor is in compliance.
- B. The Contractor through the PSO shall oversee and be responsible for the provision and maintenance of, including but not limited to the following:
  - 1. A log of safety inspections performed.
  - 2. A proper and adequate First Aid kit shall be maintained on site for one time treatment of minor cuts, scratches, burns, splinters and the like.
  - 3. All applicable Material Safety Data Sheets shall be on site prior to the use of said materials.
  - 4. Display in clear view of the on-site personnel all applicable Federal, State and local regulations dealing with safety including a map denoting the route to the nearest emergency care facility with emergency phone numbers.
  - 5. Maintain an adequate Fire Protection and Prevention plan.

- a. Fire fighting equipment must be well maintained and freely accessible on site in conspicuous locations at all times.
- b. Fire extinguishers must comply with all applicable Cal OSHA specification.
- c. Work shall be carried out complying with the California Fire Code, latest edition as applicable to construction work.
- 6. Employee Safety Training including but not limited to:
  - All equipment operators must be trained and certified as per Contractors INJURY AND ILLNESS PREVENTION PROGRAM (IIPP):
  - b. Training in the use of fire extinguishers.
  - c. Flaggers must be trained.
  - d. Safe Scaffolding usage.
- 7. Lock-out and block-out procedures for machinery, equipment, electrical and tool related hazards.
- 8. Heavy equipment procedures and standards.
- 9. Excavation and trenching hazards.
- 10. Job site must be fenced adequately (see Section 015000-Construction Facilities and Temporary Controls) to protect Public, including gates to be kept secured at all times. In the rare cases when fences must be temporarily opened to public areas to facilitate construction or the work area can not be effectively fenced, Flaggers must be provided. Job site must be fully secured by the end of the workday with no remaining hazards or obstacles in the public areas.
  - a. Flaggers must be placed in locations so as to give effective warning.
  - b. Flaggers must wear orange or strong yellow-green warning garments, such as vests, jackets, shirts, or rainwear.
- 11. Electrical hazards and safe procedures.
- 12. Musculoskeletal hazards.
- 13. Hazards causing chronic illness, such as exposure to lead, asbestos, and other cancer-causing products.
- 14. A severe weather plan including ceasing or modifying on-site operations during high temperature, lightning, or high wind velocities, etc.
- 15. No damaged or hazardous tools will be tolerated on site including but not limited to frayed or damaged electric cords, any tools with missing or altered original safety devices or switches, ladders without proper slip-resistant feet, etc.

- 16. Any work done using ladders must conform to original proper use of said ladders and all OSHA guidelines. (i.e. including but not limited to top rung of a step ladder is not to be used as a step, extension ladders must extend three rungs above the proposed use height, etc.)
- 17. All employees must wear proper Personal Protective Equipment (PPE) and abide by safety work ethics included but not limited to hard hat, proper shoes, long pants, and clothing including gloves, protective eyewear and respirators, no loose clothing, long hair must be restrained, etc.
- C. Provide a site specific written review of potential or predictable Fall Protection Hazards from heights of six (6) feet or greater. The review should address the need for Fall Protection Systems to mitigate hazards and include equipment and methods employed, responsibilities, training requirements, and monitoring methods. The erection and dismantling operations of scaffolds as well as the fall zones around scaffolds must be included as well.
  - 1. All Fall Protection systems must be properly implemented and maintained.
  - 2. Fall Protection Plan must be implemented when a Fall Protection System is required but cannot be used. A Fall Protection Plan must be written by a qualified person identified in the plan and actively responsible for the implementation.
- D. Job site safety practices found by County representatives to be in violation of any of Contractors INJURY AND ILLNESS PREVENTION PROGRAM (IIPP) or applicable Federal, State and local occupational safety regulations including any Cal-OSHA issued materials shall be grounds for LBCC to direct the cessation of all work activities and operations affected by this violation at no cost to LBCC until such time as the Contractor notifies LBCC in writing that the Contractor is in compliance.
- E. Safety Indemnification. To the extent allowed by law, the Contractor agrees to defend, indemnify and hold harmless LBCC and its officers, employees and agents including PI, AOR, AOR's consultants, and BMT from and against any and all investigations, complaints, citations, liability, expense (including defense costs and legal fees), claims and/or causes of action for damages of any nature whatsoever, including but not limited to injury or death to employees of the Contractor or its subcontractors or Agency, attributable to any alleged act or omission of the Contractor or its subcontractors which is in violation of any cal/OSHA regulation. The obligation to defend, indemnify and hold harmless includes all investigations and proceedings associated with purported violations of Section 336.10 of Title 8 of the California Code of Regulations pertaining to multi-employer work sites. The Agency may deduct from any payment otherwise due the Contractor any costs incurred or anticipated to be incurred by the Agency, including legal fees and staff costs, associated with any investigation or enforcement proceeding brought by cal/OSHA arising out of the Project.

END OF SECTION 013527

## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
  - 1. Division 1 Section "Construction Schedule" for developing a schedule of required tests and inspections.
  - 2. Division 1 Section "Testing and Inspection" for required tests and inspections and testing and inspection criteria.
  - 3. Divisions 2 through 26 Sections for specific test and inspection requirements.

#### 1.3 DEFINITIONS

- A. DSA: State of California, Division of the State Architect.
- B. AOR: Architect of Record
- C. CM-Construction Manager
- D. Contractor General Contractor

- E. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- F. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- G. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
  - 1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.
  - 2. Integrated ExterProject Inspector Mockups: Mockups of the exterProject Inspector envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
  - 3. Room Mockups: Mockups of typical interProject Inspector spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- H. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- I. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- J. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- K. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- L. Testing Agency: An LEA Certified entity approved by DSA engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- M. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

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

## 1.4 CONFLICTING REQUIREMENTS

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

#### 1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer licensed in California who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

- 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, LSA, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
  - 3. LSA: DSA Laboratory Evaluation and Acceptance Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
  - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to DSA, Owner, Construction Manager, Architect, Project Inspector, structural engineer, and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

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

## 1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
  - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner.
  - 3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report of each quality-control service to DSA, Owner, Construction Manager, Architect, Project Inspector, structural engineer, and Contractor.

- 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."
  - 1. Submit written report to Owner, Construction Manager, and Architect.
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
  - 1. Submit written report to Owner, Construction Manager, Architect, and Contractor.
- E. Retesting/Reinspection: Regardless of whether original tests or inspections were Owner's or Contractor's responsibility; Contractor shall provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Project Inspector, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify the Construction Manager, Architect, Project Inspector, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report of each test, inspection, and similar qualitycontrol service to DSA, Owner, Construction Manager, Architect, Project Inspector, structural engineer, and Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.

- 5. Delivery of samples to testing agencies.
- 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
- 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required qualityassurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
  - 1. Distribution: Distribute schedule to Owner, Construction Manager (Construction Manager), Architect, Project Inspector, structural engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

- 3.1 TEST AND INSPECTION LOG
  - A. Prepare a record of tests and inspections. Include the following:
    - 1. Date test or inspection was conducted.
    - 2. Description of the Work tested or inspected.
    - 3. Date test or inspection results were transmitted to Architect.
    - 4. Identification of testing agency or special inspector conducting test or inspection.
  - B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Project Inspector's reference during normal working hours.

#### 3.2 REPAIR AND PROTECTION

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

requirements for cutting and patching in Division 1 Section "Execution Requirements."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014200 - REFERENCES

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DEFINITIONS

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

#### 1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and

effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

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

## 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
  - 1. For additional information refer to Thomson Gale's "Encyclopedia of Associations" and Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transporta Officials www.transportation.org	tion (202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute	(248) 848-3700
		014200 - REFERENCES

## www.concrete.org

ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
АНА	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Land care Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc.	(405) 780-7372

www.aosaseed.com

APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	<ul><li>APA - The Engineered Wood Association; Engineered Wood Systems</li><li>(See APA - The Engineered Wood Association)</li></ul>	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air- Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636

AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919

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CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137	
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583	
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175	
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604	
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607	
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176	
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200	
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000	
CSA	CSA International (Formerly: IAS - International Approval Se www.csa-international.org	(866) 797-4272 rvices) (416) 747-4000	
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744	
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300	
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700	
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087	
DBIA	Design Build Institute of America www.dbia.org	(866) 692-0110	
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010	
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500	

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EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945	
EJCDC	Engineers Joint Contract Documents Commit www.ejdc.org	tee (703) 295-5000	
EJMA	Expansion Joint Manufacturers Association, www.ejma.org	nc. (914) 332-0040	
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937	
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA www.intertek.com	(800) 967-5352	
FM	FM Approvals LLC	(781) 762-4300	
Approvais	www.fmglobal.com		
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000	
FMRC	Factory Mutual Research (Now FM Global)		
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850	
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0	
GA	Gypsum Association www.gypsum.org	(202) 289-5440	
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208	
GRI	(Part of GSI)		
GS	Green Seal www.greenseal.org	(202) 872-6400	
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440	
н	Hydraulic Institute www.pumps.org	(973) 267-9700	

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HI	Hydronics Institute www.gamanet.org	(908) 464-8200	
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)		
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900	
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550	
IAS	International Approval Services (Now CSA International)		
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369	
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830	
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11	
IEEE	Institute of Electrical and Electronics Engineers, Inc. www.ieee.org	(The) (212) 419-7900	
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000	
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561	
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234	
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510	
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426	
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11	
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150	
ITS	Intertek Testing Service NA (Now ETL SEMCO)		

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ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11	
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690	
LMA	Laminating Materials Association (Now part of CPA)		
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864	
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333	
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138	
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610	
MH	Material Handling (Now MHIA)		
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190	
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222	
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578	
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200	
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926	
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084	
NBGQA	National Building Granite Quarries Association, Inc.	(800) 557-2848	

www.nbgqa.com

NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association	(888) 516-8585

www.nomma.org

NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute	(301) 340-8580

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		www.rfci.com		
	RIS	Redwood Inspection Service www.redwoodinspection.com		(888) 225-7339 (415) 382-0662
	SAE	SAE International www.sae.org		(877) 606-7323 (724) 776-4841
	SDI	Steel Deck Institute www.sdi.org		(847) 458-4647
	SDI	Steel Door Institute www.steeldoor.org		(440) 899-0010
	SEFA	Scientific Equipment and Furniture Associ www.sefalabs.com	ation	(877) 294-5424 (516) 294-5424
	SEI/ASCE	Structural Engineering Institute/American	Society of Civil	

- (See ASCE) SGCC Safety Glazing Certification Council (315) 646-2234 www.sgcc.org
- SIASecurity Industry Association<br/>www.siaonline.org(866) 817-8888<br/>(703) 683-2075
- SIGMA Sealed Insulating Glass Manufacturers Association (Now IGMA)

Engineers

- SJI Steel Joist Institute (843) 626-1995 www.steeljoist.org
- SMA Screen Manufacturers Association (561) 533-0991 www.smacentral.org
- SMACNA Sheet Metal and Air Conditioning Contractors' (703) 803-2980 National Association www.smacna.org
- SMPTE Society of Motion Picture and Television Engineers (914) 761-1100 www.smpte.org
- SPFA Spray Polyurethane Foam Alliance (800) 523-6154 (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org
- SPIB Southern Pine Inspection Bureau (The) (850) 434-2611 www.spib.org

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SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026	
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630	
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331	
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265	
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333	
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974	
TCA	Tile Council of America, Inc. (Now TCNA)		
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453	
TIA/EIA	Telecommunications Industry Association/Electron Industries Alliance www.tiaonline.org	ic (703) 907-7700	
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700	
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010	
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555	
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177	
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800	
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902	
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747	
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463	

WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

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

IAPMO	International Ass Officials www.iapmo.org	sociation of	Flumbing	and	Mechanical	(909) 472-4100
ICC	International Cod www.iccsafe.org	e Council				(888) 422-7233
ICC-ES	ICC Evaluation S www.icc-es.org	ervice, Inc.				(800) 423-6587 (562) 699-0543

UBC Uniform Building Code (See ICC)

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

CE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology	(301) 975-6478

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	www.nist.gov		
OSHA	Occupational Safety & Health Administra www.osha.gov	ation	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)		
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs		(202) 690-7694
RUS	Rural Utilities Service (See USDA)		(202) 720-9540
SD	State Department www.state.gov		(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org		(202) 334-2934
USDA	Department of Agriculture www.usda.gov		(202) 720-2791
USPS	Postal Service www.usps.com		(202) 268-2000

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

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	

- FED-STD Federal Standard (See FS)
- FS Federal Specification (215) 697-2664 Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil

Available from Defense Standardization Program www.dps.dla.mil

Available from General Services Administration (202) 619-8925 www.gsa.gov

Available from National Institute of Building Sciences (202) 289-7800 www.wbdg.org/ccb

- FTMS Federal Test Method Standard (See FS)
- MIL (See MILSPEC)
- MIL-STD (See MILSPEC)
- MILSPEC Military Specification and Standards (215) 697-2664 Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil
- UFAS Uniform Federal Accessibility Standards (800) 872-2253 Available from Access Board (202) 272-0080 www.access-board.gov
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBSC State of California, Building Standards Commission (916) 263-0916	CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation	(800) 952-5210 (916) 574-2041
	CBSC	State of California, Building Standards Commission	(916) 263-0916
	CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CCR California Code of Regulations (916) 323-6815 www.calregs.com	CPUC	California Public Utilities Commission	(415) 703-2782

www.cpuc.ca.gov

DSA	State of California, Division of the State Architect DSA Headquarters Office Mr. David F. Thorman, AIA State Architect of California 1102 Q Street, Suite 5100 Sacramento, California 95811	(916) 445-8100
DSA	State of California, Division of the State Architect DSA San Francisco Bay Area Regional Office 1515 Clay Street, Suite 1201 Oakland, California 94612 www.dsa.dgs.ca.gov/default	(510) 622-3101
DSA	State of California, Division of the State Architect DSA Sacramento Regional Office 1102 Q Street, Suite 5200 Sacramento, California 95814 www.dsa.dgs.ca.gov/default	(916) 445-8730
DSA	State of California, Division of the State Architect DSA Los Angeles Basin Regional Office 355 S. Grand Avenue Los Angeles, California 90266 www.dsa.dgs.ca.gov/default	(213) 897-3995
DSA	State of California, Division of the State Architect DSA San Diego Regional Office 16680 West Bernardo Drive San Diego, California 92127 www.dsa.dgs.ca.gov/default	(858) 674-5400
TFS	Texas Forest Service Forest Resource Development http://txforestservice.tamu.edu	(979) 458-6650
PART 2 - PROI	DUCTS (Not Used)	

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

# SECTION 014213 - ABBREVIATIONS, SYMBOLS AND ACRONYMS

## PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

psf

A. List of abbreviations, symbols and acronyms used in these Specifications.

1.02	ABBREVI	ATIONS:	
		<b>O</b> utrine a m <sup>2</sup> a	Λ

OAR	Owner's Authorized Representative, I.e., Construction Manager,
AOR	Architect of Record
FOR	Engineer of Record
PM	Project Manager, OAR
IOR	Inspector of Record, Owner's Inspector, Project Inspector
ac	Alternating current
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
lb	Pound
LED	Light emitting dial
MBH	1000 BTUs per hour
mfr	Manufacturer
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
OZ.	Ounce
pН	Acidity-alkalinity balance

Pounds per square foot

1.03

1.04

psi psig RF rpm V WB	Pounds per square inch Pounds per square inch, gage Radio frequency Revolutions per minute Volt Wet bulb
SYMBOLS	
# ' %	Number Foot/Feet Inch(es) Percent
ACRONYMS	
AE	Architect and engineer(s)
ABMS ABPA ACI AGA AHAM AISC AISI AITC AMCA AMCA ANSI APA AQMD ARI ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	ABMA American Boiler Manufacturers Association American Bureau of Metal Statistics American Board Products Association American Concrete Institute American Gas Association Association of Heating and Air Conditioning Manufacturers American Institute of Steel Construction American Institute of Steel Institute American Institute of Timber Construction Air Moving and Conditioning Association, Inc. American National Standards Institute American Plywood Association Air Quality Management District Air-Conditioning and Refrigeration Institute American Society of Heating, Refrigeration and Air Conditioning Engineers American Society of Mechanical Engineers American Society for Testing and Materials Architectural Woodwork Institute American Wood Preservers Association American Wood Preservers Institute American Welding Society American Welding Society
BHMA BIA	Builders Hardware Manufacturers Association Brick Institute of America
CBC CCR CISPI CLFMI CQC CRA CRSI	California Building Code California Code of Regulations Cast Iron Soil Pipe Institute Chain Link Fence Manufacturers Institute California Quality Control (CMA Standards) California Redwood Association Concrete Reinforcing Steel Institute

CS	Commercial Standards, U.S. Department of Commerce
CTI	Ceramic Tile Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DSA	Division of the State Architect
DBE	Design-Build Entity, Design-Builder
DGS	Department of General Services
FCC	Federal Communication Commission
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specifications
HPMA	Hardwood Plywood Manufacturers Association
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
Mep MIA MIA MLSFA MSS	Mechanical, electrical, and plumbing Marble Institute of America Masonry Institute of America Metal Lath/Steel Framing Association Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM NBFU NBS NCMA NEMA NESC NFPA NFPA NOFMA NPCA NSF NTMA NWMA	National Association of Architectural Metal Manufacturers National Board of Fire Underwriters National Bureau of Standards National Concrete Masonry Association National Electrical Manufacturers Association National Electrical Safety Code National Fire Protection Association National Forest Products Association National Oak Flooring Manufacturers Association National Oak Flooring Manufacturers Association National Paint and Coatings Association National Sanitation Foundation National Terrazzo & Mosaic Association National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
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RFCI	Resilient Floor Covering Institute
SCMA	Southern Cypress Manufacturers Association
SDI	Steel Deck Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structure Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UCI	Uniform Construction Index
UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
WCLIB	West Coast Lumber Inspection Bureau
WI (WIC)	Woodwork Institute
WWPA	Western Wood Products Association

END OF SECTION 014213

## SECTION 014523 - TESTING AND INSPECTION

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
  - A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.
- 1.2 SECTION INCLUDES
  - A. This Section includes the following:
    - 1. Testing and inspection services to meet requirements of the 2019 California Building Code (CBC), Title 24, Parts 1 and 2, as indicated in Contract Documents.
      - a. One or more DSA certified inspectors employed by the Owner in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Sections 4-333(b), 4-333(c), and 4-342.
    - 2. Test of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.
  - B. Related Sections include the following:
    - 1. Division 1 Section "Construction Schedule".
    - 2. Division 1 Section "Submittal Procedures".
    - 3. Division 1 Section "Test and Balance".
    - 4. Division 1 Section "Construction Facilities and Temporary Controls ".
    - 5. Division 1 Section "Execution Requirements".
    - 6. Division 2 Section "Selective Demolition".
    - 7. Division 1 Section "Closeout Procedures".

# 1.3 DEFINITIONS

- A. CBC: California Building Code.
- B. DSA: State of California, Division of the State Architect.
- C. OAR: Owner's Authorized Representative.

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION

- 3.1 TESTS
  - A. Owner will select and provide an DSA certified independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency or the nd not by Contractor.
    - 1. Procedural and acceptance criteria shall be as set forth in Section 4-335 of the California Building Standards Administrative Code.
    - 2. As set forth in CBC Section 1705A.1.
  - B. Owner will directly reimburse testing agency all costs for all DSA required tests and inspections, but may be reimbursed by Contractor for such costs as noted in related sections of the Contract Documents.
    - 1. Contractor will reimburse Owner or directly reimburse testing agency all costs for retesting required by failed tests as set forth in Sections 4-333(c) and 4-335(c) of the California Building Standards Administrative Code.
  - C. Independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
  - D. Independent testing agency shall not perform any duties of Contractor.
  - E. Contractor shall notify the Owner's Authorized Representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract Documents be tested, in order that the Owner may arrange for the testing of same at the source of supply.
  - F. Any material shipped by Contractor from source of supply prior to having satisfactorily passed such required testing and inspection or prior to receipt of notice from IOR such testing and inspection is not required shall not be incorporated into the Work.
  - G. Contractor shall provide an insulated curing box with capacity for not less than twenty (20) concrete cylinders and relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

### 3.2 TEST REPORTS

A. One copy of each test report shall be forwarded directly to DSA by the testing agency. Additional copies of each test report shall be forwarded directly to Owner, Architect, Contractor, Project Inspector, Owner's Authorized Representative, and Structural Engineer by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of CBC, Title 24, Parts 1 and 2, and with the approved Contract Documents. Test reports shall show the specified design strength. Test reports shall also definitely state whether or not material or materials tested comply with the specified requirements.

1. As set forth in Section 4-335(d) of the California Building Standards Administrative Code.

## 3.3 VERIFICATION OF TEST REPORTS

- A. Testing agency shall submit to DSA a verified report, in duplicate, covering tests that were performed by that agency during the progress of the Work. Additional copies of each test report shall be forwarded directly to Owner, Architect, Contractor, Project Inspector, Owner's Authorized Representative, and structural engineer by the testing agency. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.
  - 1. As set forth in Sections 4-335(e) and 4-336 of the California Building Standards Administrative Code.

## 3.4 INSPECTION BY OWNER

- A. Owner, and Owner's Authorized Representative shall at all times have access, for purpose of inspection, to all parts of the Work and to all shops wherein the Work is in preparation. Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- B. Owner, and Owner's Authorized Representative shall have the right to reject materials and workmanship deemed defective Work, and to require their correction. Rejected workmanship shall be corrected in a satisfactory manner and rejected materials shall be removed from the premises and legally disposed of, all without charge to Owner. If Contractor does not correct such rejected Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, Owner may correct such rejected Work and proceed in accordance with related Articles of the Contract Documents.
- C. Should it be considered necessary or advisable by the Owner and Owner's Authorized Representative at any time prior to Final Acceptance of the entire Work to make an examination of the Work already completed by removing or tearing out the same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and materials. If such work is found to be defective in any respect due to the fault of the Contractor or any of his subcontractors, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of Contract Documents, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.
- D. Contractor is responsible for compliance with all applicable local, state, and federal codes, regulations, ordinances, restrictions, and requirements.

## 3.5 PROJECT INSPECTOR

- A. Project inspector, employed by the Owner in accordance with requirements of California Code of Regulations, Title 24, will be assigned to the work.
  - 1. Project inspector shall be approved by Architect, Structural Engineer, and DSA.
  - 2. As set forth in Section 4-333(b) of the California Building Standards Administrative Code.
  - 3. Duties of project inspector are specifically defined in Section 4-342 of the California Building Standards Administrative Code.
- B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the project inspector. He shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the project inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the Work and the character of the materials.
- C. Inspection of Work shall not relieve Contractor from any obligation to fulfill all of the terms and conditions of the Contract Documents.
- D. Contractor shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.
  - 1. Contractor shall perform quality control inspection of work prior to filling out an inspection request to the inspector of record.
- 3.6 SPECIAL INSPECTOR
  - A. Special Inspector:
    - 1. As set forth in Section 4-333(c) of the California Building Standards Administrative Code.
    - 2. As set forth in CBC Section 1701A.5, 1704A.1.

### 3.7 TESTS AND INSPECTIONS

- A. The following tests and inspection requirements are based on the 2019 California Building Code, Part 2 of the California Code of Regulations, Title 24, California Building Standards Code, (latest version of the International Building Code (IBC) with California Amendments).
- B. Required tests and inspections include but are not limited to the following.
  - 1. All required inspections, as applicable, shown in the California Building Code.
  - 2. All tests required per DSA 103 Statement of Structural Tests and Special Inspections card.
  - Inspections listed within project specifications located within divisions 1 through 33.

- C. Excavations, Foundations and Retaining Walls: CBC, Chapter 18A.
  - 1. Inspection:
    - a. Inspection of Piles and Piers Installation: 1705A.7.1, 1810A.
- D. Concrete: CBC, Chapter 19A.
  - 1. Materials:
    - a. Concrete Materials: 1705A.3, 1904A.2.
    - b. Portland Cement: 1903A.1, 1913A.1.
    - c. Concrete Aggregate: 1903A.6.
    - d. Reinforcing Bars: 1903A.
    - e. Fly Ash: 1903A.5.
  - 2. Quality:
    - a. Concrete Proportions: 1903A, 1904A.2.
    - b. Shotcrete Proportions: 1910A.
    - c. Concrete Testing: 1903A.
    - d. Shotcrete Testing: 1913A.5.
    - e. Mixing and Placing: 1903A.
    - f. Curing: 1903A.
    - g. Cold Weather Requirements: ACI 318-11, SECTION 5.12.
    - h. Hot Weather Requirements: ACI 318-11, SECTION 5.13.
    - i. Post-Installed Anchors in Concrete: 1913A.7.
  - 3. Inspection:
    - a. Project Site Inspection: 1903A.
    - b. Batch Plant Inspection: 1705A.3.2.
    - c. Waiver of Material Testing: 1705A.3.3.
    - d. Pre-stressed Concrete Inspection: 1705A.3.4.
    - e. Shotcrete Inspection: 1705A.18.
    - f. Reinforcing Bar Welding Inspection: 1705A.2.2.1.2.
- E. Lightweight Metal CBC, Chapter 20A:
  - 1. Materials
    - a. Alloys: 2001.1
    - b. Identification: 2002.1
  - 2. Inspection
    - a. Welding: 2003.1
- F. Aluminum: CBC, Chapter 20:
  - 1. Materials:
    - a. Aluminum Materials: 2002.1.
  - 2. Inspection:

- a. Aluminum Inspection: 2003.1
- G. Wood: CBC, Chapter 23.
  - 1. Materials:
    - a. Sawn Lumber: 2303.1.1.
    - b. Prefabricated Wood I-Joists: 2303.1.2.
    - c. Structural Glued-Laminated Timbers: 2303.1.3.
    - d. Wood Structural Panels: 2303.1.4.
    - e. Preservative Treated Wood: 2303.1.8.
    - f. Moisture Content: 2303.1.8.2.
    - g. Fire-Retardant-Treated Wood: 2303.2.
    - h. Hardwood and Plywood: 2303.3.
    - i. Wood Trusses: 2303.4.
    - j. Joist Hangers and Connectors: 2303.5.
    - k. Nails and Staples: 2303.6.
  - 2. Inspection:
    - a. Wood Construction: 1705A.5.
    - b. Timber Connectors: 1705A.5.6.
- H. Exterior Wall Coverings: CBC, Chapter 14, 25.
  - 1. Materials:
    - a. Adhered Masonry Veneer: 1405.10.
    - b. Portland Cement Plaster: 2507.1, 2507.2.
  - 2. Inspection:
    - a. Adhered Masonry Veneer Inspection: 1705A.4.1.
    - b. Portland Cement Plaster Inspection: 2503.1, 2503.2.
    - c. Exterior Insulation and Finish System (EFIS): 1705A.15.

END OF SECTION 014523

### SECTION 015000 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

### PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Temporary utilities, construction facilities and controls to be provided, maintained, relocated, and removed by CONTRACTOR

#### 1.02 RELATED SECTIONS AND DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Section 011000: Summary
- C. Section 012973: Schedule of Values
- E. Section 015723: Storm Water Pollution Control Measures
- F. Section 013210: Construction Schedule
- G. Section 014523: Testing and Inspection
- H. Section 018620: Test and Balance
- I. Section 017700: Closeout Procedures

### 1.03 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

#### 1.04 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

### 1.05 QUALITY ASSURANCE

- A. CONTRACTOR shall comply with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
  - 1. Building Code requirements
  - 2. Division of State Architect
  - 3. Health and safety regulations
  - 4. Utility company regulations
  - 5. Police, fire department and rescue squad requirements
  - 6. Environmental protection regulations
- B. CONTRACTOR shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to Owner's Authorized Representative.
- C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with California Electrical Code (CEC).
- D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- E. Accessible Temporary Egress: Comply with applicable provisions in the California Building Code (CBC), the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, and ICC/ANSI A117.1.

### 1.06 PROJECT CONDITIONS

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

PART 2 - PRODUCTS (Not used)

### PART 3 - EXECUTION

- 3.01 QUALITY ASSURANCE
  - A. CONTRACTOR provided facilities are to be in place and available for OWNER use and occupancy within **ten (10)** calendar days following the date of issue of the Notice to Proceed and shall remain in place and available for OWNER use and occupancy throughout the full term of the Contract.
  - B. Interior Air Quality (IAQ) During Construction:

- 1. Referenced Standards include:
  - i. ASHRAE 62.1 2004.
  - ii. ASHRAE 52.2 1999.
  - iii. CHPS Best Practices Manual Volume III (2006 Edition).
- 2. Interior Air Quality (IAQ) During Construction Plan: CONTRACTOR is required to develop and submit to the OWNER for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided as Appendix A of this Specification. Plan shall be submitted within 120 days of NTP. Implementation of the approved (IAQ) Plan will be included in the project construction schedule.
- 3. Construction Photos Requirement: CONTRACTOR shall submit photographs that demonstrate the Construction Ventilation, Preconditioning, Sequencing, and Protection measures taken during the project for complying with the IAQ plan, applicable specifications and referenced standards.
- 3.02 TEMPORARY UTILITIES
  - A. CONTRACTOR shall submit to Owner's Authorized Representative reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.
  - B. CONTRACTOR shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, CONTRACTOR shall provide and install the remainder with matching compatible materials and equipment.
  - C. Temporary Water:
    - 1. CONTRACTOR shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary water lines, connections & fees, extensions and distribution, metering devices and use charges, deliveries/pick-ups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary water system, and upon Substantial Completion of the Work, removal of all such temporary water system devices and appurtenances.
    - 2. CONTRACTOR shall provide and maintain temporary water service, including water distribution piping and outlet devices of the size and required flow rates in order to provide service to all areas of the Project site.
    - 3. CONTRACTOR shall provide and pay for all potable water needed for construction and all other uses associated with the Work.

- 4. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary water systems as rapidly as required in order to provide for progress of the Work.
- D. Temporary Electric:
  - 1. CONTRACTOR shall furnish, install, maintain and pay for all necessary permits, inspections, temporary wiring, metering devices and use charges, move ins/outs, connections & fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary electric systems and upon Substantial Completion of Work, removal of all such temporary electric systems and appurtenances.
  - 2. CONTRACTOR shall furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.
  - 3. CONTRACTOR shall provide temporary electric for construction, temporary facilities, and connections for construction equipment requiring power or lighting, at all points required for the Work, for inspection and safety.
  - 4. CONTRACTOR shall provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.
  - 5. CONTRACTOR shall ensure welding equipment is supplied by electrical generators.
  - 6. CONTRACTOR shall at their expense and without limitation remove, extend and/or relocate temporary electric systems as rapidly as required in order to provide for progress of the Work.
- E. Temporary Gas:
  - 1. CONTRACTOR shall furnish, install, maintain and pay for all necessary permits, inspections, metering devices and use charges, move ins/out, extension and distribution, deliveries/pickups, rentals, storage, transportation, equipment and piping, rentals, taxes, labor, material, insurance, bonds, and all other required miscellaneous items for the temporary gas systems necessary to perform the Work, and upon Substantial Completion of the Work, removal of all such temporary gas system devices and appurtenances.
  - 2. CONTRACTOR shall at their expense and without limitation remove, extend and/or relocate temporary gas systems as rapidly as required in order to provide for progress of the Work.

- F. Temporary Heating, Ventilation and Air Conditioning:
  - 1. CONTRACTOR shall furnish, install, maintain, and pay for all necessary permits, inspections, move ins/out, extensions and distribution, connections and fees, use charges, metering devices and use charges, equipment, rentals, deliveries/pick-ups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary heat and ventilation needed for proper installation of the Work and to protect materials and finishes from damage due to weather. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary heating and ventilating system devices and appurtenances.
  - 2. CONTRACTOR shall provide, maintain and pay for all temporary ventilation of enclosed Work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.
  - 3. OWNER will not accept utilization of the permanent HVAC system for temporary HVAC until Substantial Completion.
  - 4. CONTRACTOR shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the Work.
  - 5. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.
- G. Temporary Telephone and Data:
  - 1. CONTRACTOR shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and distribution to Project site temporary offices as required by this Section and Section 015000, 3.03.
  - 3. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary phone service and distribution as rapidly as required in order to provide for progress of the Work.
  - 4. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary phone service, distribution, devices and appurtenances.

3.03 CONTRACTOR PROVIDED FACILITIES

A. CONTRACTOR shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, elevators, hoists, scaffolds, railings and other facilities or services as required. CONTRACTOR shall be responsible for providing,

installation, maintenance, supplying, and all use charges for the items provided under Section 015000.

- B. INSTALLATION, GENERAL
  - 1. Prepare a plan showing location or relocation of temporary facilities for the Owner's review. Owner shall approve location of all temporary facilities prior to installation.
  - 2. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 3. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
  - 4. Restore all areas to condition prior to start of construction.
- C. Temporary Offices:
  - 1. Field Office for Contractor: Prefabricated or mobile trailer unit(s) with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip office as necessary for Contractor's field staff, including the DBE architect and as follows:
    - a. This office shall be of substantial waterproof construction with adequate natural light and ventilation by means of stock windows.
    - b. The Contractor shall provide and pay for adequate electric lights, private local telephone services with a loud exterior bell, and an adequate heating and cooling system. For the duration of the Project and coordination with the Owner.
    - c. Provide a dedicated DSL line-multiple jacks or dedicated wireless internet connection, phone line, desk, office chair, plan rack, Two (2) power surge protectors, a conference room with table and chairs for 12 people. Security pad for the trailer system, mini blinds for the windows, A/C and Heating and a Clock.
    - d. Contractor to provide all entry locks keyed alike, an exterior locking bar device each office to have lockable doors. Offices to be at each end of the trailer with Conference area in the center
    - e. Install a plan reviewing table secured to the wall.
    - f. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.

- 2. Temporary Offices: Contractor acknowledges that the building footprint may occupy/occupies the majority of the project site and that the Contractor may have to secure additional areas off-site for the location of temporary office facilities for Contractor parking, lay-down and storage areas.
- 3. Field office for Construction Manager and Inspector of Record (IOR): Prefabricated or mobile trailer unit(s) with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip as necessary to provide for one (1) Construction Manager office, one (1) IOR office and two (2) field staff workstations.
  - a. Provide dedicated individual office space for IOR and Construction Manager, to include their own desks and chairs and internet connections.
  - b. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - c. Conference room of sufficient size to accommodate meetings of 12 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.
  - d. Drinking water and private toilet.
  - e. The Contractor to provide 8 ½x11 Paper and toner for the use by the IOR for the copy machine and fax machine on an as needed monthly basis.
  - f. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degree F.
  - g. Lighting fixtures capable of maintaining average illumination of 20 foot candles at desk height.
  - h. Install a plan reviewing table secured to the wall.
  - i. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.
  - j. Contractor to provide dedicated toilet facilities for the IOR use and weekly cleaning service.
- 4. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - a. Store combustible materials apart from building.
- D. At CONTRACTOR'S expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.
- E. Temporary Storage Units:
  - 1. CONTRACTOR shall provide secure and waterproof storage units for the temporary storage of equipment and other items requiring protection.

- 3. CONTRACTOR shall be responsible for all delivery charges and will install the storage unit in an appropriate area.
- 4. CONTRACTOR shall remove the storage unit from the Project site when the storage unit is no longer required for the Work or upon Substantial Completion of the Work.
- 5. CONTRACTOR shall at their expense and without limitation remove and/ or relocate storage units as rapidly as required in order to provide for progress of the Work.
- F. Temporary Sanitary Facilities:
  - 1. CONTRACTOR shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.
  - 2. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project site upon Substantial Completion of the Work. CONTRACTOR shall keep both OWNER chemical toilet facilities and OWNER trailer restroom clean and operational at all times.
  - 3. CONTRACTOR employees shall not use College toilet facilities.
  - 4. At CONTRACTOR'S expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.
  - 5. CONTRACTOR will contain their breaks and lunch periods to the areas designated by Owner's Authorized Representative or any public area outside the Project site. CONTRACTOR shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.
- G. Temporary Security Fence/Barricade:
  - 1. CONTRACTOR is responsible for providing site enclosure, other fences, and barricades prior to starting construction operations. Install portable chain-link enclosure fence with lockable entrance gates. Locate as required, or enclose entire project site or portion determined sufficient by the Construction Manager to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering site except by entrance gates.
  - 2. Where the District has currently or previously installed a perimeter fence to this project, but if the Contractor needs to relocate or temporarily move any of these fence panels, then it is the Contractors responsibility for this work and any subsequent cost. Security of Project site and contents is a continuous obligation of CONTRACTOR.

- 3. The Contractor is responsible for maintaining the wind screen to the fence Windscreen, all rips, tears, missing sections shall be corrected by the Contractor upon notification by Owner's Authorized Representative.
  - At CONTRACTOR'S expense and without limitation remove and/or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.
- H. Other Temporary Enclosures & Barricades:
  - 1. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.
  - 2. Provide protective barriers around trees, plants and other improvements designated to remain. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
  - 3. Temporary partitions shall be installed at all openings where additions connect to existing buildings, and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight, fire areas, safety and security. Temporary partitions shall be as designated on the Drawings or as specified by ARCHITECT. At CONTRACTOR'S expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.
  - 4. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, CONTRACTOR shall, in his sole judgment and in accordance with applicable safety standards, provide all temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. CONTRACTOR is responsible for any damage, which may occur to the property and occupants of the property of OWNER or adjacent private or public properties which in any way results from the acts or neglect of CONTRACTOR.
  - 5. CONTRACTOR shall be responsible for cleaning up all areas adjacent to the construction site which have been affected by the construction; and for restoring them to at least their original condition including landscaping; planting of trees, sod, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass sheet metal, bricks, and waste concrete. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract.

- 6. CONTRACTOR shall ensure sediment does not block storm drains. CONTRACTOR shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area.
- 7. CONTRACTOR to ensure all site drive entrances have rumble plates to remove dirt from construction vehicles before leaving the site.
- I. Temporary Storage Yards:
  - 1. CONTRACTOR shall fence and maintain storage yards in an orderly manner.
  - 2. Provide storage units for materials that cannot be stored outside.
  - 3. At CONTRACTOR'S expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.
- J. Temporary De-watering Facilities & Drainage: Comply with requirements of authorities having jurisdiction. Maintain project site, excavations, and construction free of water.
  - 1. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections. CONTRACTOR shall maintain the Work, Project site and related areas free of water.
  - 2. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Division 01 & 02 Sections. CONTRACTOR shall be responsible for, but not limited to, de-watering of excavations, trenches & below grade areas of buildings, structures, the Project site and related areas.
  - 3. Dispose of rainwater in a lawful manner and will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- K. Temporary Protection Facilities Installation:
  - 1. CONTRACTOR shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by Owner's Authorized Representative.
  - 2. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, CONTRACTOR shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. Comply with NFPA 241.
    - a. CONTRACTOR shall prohibit smoking in construction areas.

- b. CONTRACTOR shall supervise welding operations, combustiontype temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
- c. CONTRACTOR shall develop and supervise an overall fireprevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
- d. When required, provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
- 3. CONTRACTOR shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, CONTRACTOR shall provide secure lock up to protect against vandalism, theft and similar violations of security. OWNER accepts no financial responsibility for loss, damage, vandalism or theft.
- 4. CONTRACTOR operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by Owner's Authorized Representative. CONTACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fire fighting equipment and/or personnel.
- 5. With approval of Owner's Authorized Representative and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use. Instruct OWNER personnel in use of permanent fire protection facilities.
- 6. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. CONTRACTOR shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.
- L. Temporary Security and Safety Measures:
  - 1. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
    - a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
    - b. Install lighting for Project identification sign.
  - 2. During performance of the Work, CONTRACTOR shall provide, install and maintain substantial temporary barriers and/or partitions separating

all Work areas from areas occupied by students, faculty and/or administrative staff.

- 3. CONTRACTOR shall employ and maintain sufficient security and safety measures to effectively prevent vandalism, vagrancy, theft, arson, and all other such negative impacts to the Work. Any impacts to the progress of the Work of CONTRACTOR, OWNER, or OWNER'S forces, due to loss from inadequate security, will be the responsibility of CONTRACTOR.
- 4. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - a. Truck cranes and similar devices for hoisting materials and considered "tools and equipment" and not temporary facilities.
- 5. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- 6. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.
- 7. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site where hazardous operations may occur overhead. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
  - a. Construct covered walkways using scaffold or shoring framing.
  - b. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - c. Paint and maintain appearance of walkway for duration of the Work.
- M. Temporary Access Roads and Staging Areas:
  - 1. Traffic Controls: Comply with requirements of authorities having jurisdiction.
    - a. Protect existing site improvements to remain including curbs, pavement, and utilities.
    - b. Maintain access for fire-fighting equipment and access to fire hydrants.
    - 3. Provide a minimum of two (2) flagmen on each side of vehicles entering or exiting Site through adjacent drives or parking lots at all times. IN NO CASE SHALL VEHICLES BE ALLOWED TO PASS THROUGH ADJACENT DRIVEWAYS, WALKWAYS, OR PARKING LOTS UNESCORTED BY MARKED FLAGMEN.
  - 2. Due to the limited amount of on and off Project site space for the parking of staff and school visitor's vehicles there will be no parking of CONTRACTOR vehicles in areas designated for school use only. CONTRACTOR shall provide legal access to and maintain

CONTRACTOR designated areas for the legal parking, loading, offloading & delivery of all vehicles associated with the Work. CONTRACTOR shall be solely responsible for providing and maintaining these requirements whether on or off the Project site. CONTRACTOR shall provide and maintain ample on-site parking spaces designated for the exclusive use of OWNER. CONTRACTOR shall erect signs as required by OWNER each of these spaces and prevent all unauthorized vehicles from parking in the OWNER-reserved spaces.

- 2. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project site.
- 3. CONTRACTOR will be permitted to utilize existing facility campus roads as designated by Owner's Authorized Representative. CONTRACTOR shall only utilize those entrances and exits as designated by Owner's Authorized Representative and CONTRACTOR shall observe all traffic regulations of OWNER.
- 4 CONTRACTOR shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.
- N. MOISTURE AND MOLD CONTROL
  - 1. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
  - 2. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
    - a. Protect porous materials from water damage.
    - b. Protect stored and installed material from flowing or standing water.
    - c. Keep porous and organic materials from coming into prolonged contact with concrete.
    - d. Remove standing water from decks.
    - e. Keep deck openings covered or dammed.
  - 3. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
    - a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
    - b. Keep interior spaces reasonably clean and protected from water damage.
    - c. Periodically collect and remove waste containing cellulose or other organic matter.

- d. Discard or replace water-damaged material.
- e. Do not install material that is wet.
- f. Discard, replace or clean stored or installed material that begins to grow mold.
- g. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- 4. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  - a. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  - b. Use permanent HVAC system to control humidity.
  - c. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - 1. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    - 2. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - 3. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

# 3.04 PROJECT SIGNAGE

- A. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - a. Identification Signs: Provide Project identification signs.
  - b. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
  - c. Maintain and touchup signs so they are legible at all times.
- B. No other signs shall be displayed without approval of Owner's Authorized Representative. At CONTRACTOR'S expense and without limitation, remove and/or relocate Project signage and related facilities as rapidly as required in order to provide for progress of the Work.
- C. CONTRACTOR shall remove Project signage at Substantial Completion of the Work.
- D. Until Substantial Completion of the Work, CONTRACTOR shall employ appropriate means to remove all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project site within

twenty-four (24) hours from the date of report or forty-eight (48) hours of each occurrence.

- G. CONTRACTOR shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by Owner's Authorized Representative.
  - 1. For construction traffic control/flow at entrances/exits, and as designated by Owner's Authorized Representative.
  - 2. To direct visitors.
  - 3. For construction parking.
  - 4. To direct deliveries.
  - 5. For Warning Signs as required.
  - 6. In accordance with CAL/OSHA standards as necessary.
  - 7. For trailer identification and Project site address.
  - 8. For "No Smoking" safe work site at designated locations.
  - 9. Emergency contact information and phone number of CONTRACTOR.
  - 10. Emergency contact information and phone number of local police, fire, and emergency personnel.
  - 11. For Labor Compliance Program (LCP) as required under the General Conditions (Prevailing wage rates and Notice of LCP)
  - 12. Employee benefits payments paid to trust funds are required under the General Conditions.

### 3.05 TRENCHES

- A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by CONTRACTOR. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed. Required access to buildings shall be provided and maintained. CONTRACTOR shall comply with all applicable statutes, codes & regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.
- 3.06 DUST CONTROL
  - A. CONTRACTOR is responsible for dust control on and off the Project site. When Work operations produce dust the Project site and/or streets shall be sprinkled

with water to minimize the generation of dust. CONTRACTOR shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project site. CONTRACTOR shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of CONTRACTOR.

## 3.07 WASH OUT

- A. CONTRACTOR shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. CONTRACTOR shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. CONTRACTOR shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by Owner's Authorized Representative.
- 3.08 WASTE DISPOSAL
  - A. Comply with requirements specified in Division 1 Section "Construction Waste Management".
  - B. CONTRACTOR shall provide and maintain trash bins on the Project site. Trash bins shall be serviced on an as needed basis and CONTRACTOR is responsible for the transportation of and the legal disposal of all contents.

### 3.09 ADVERSE WEATHER CONDITIONS

- A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, CONTRACTOR shall provide every practical precaution to prevent damage to the Work, Project site and adjacent property. CONTRACTOR precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.
- B. CONTRACTOR shall provide and maintain drainage away from buildings and structures.
- C. CONTRACTOR shall implement all required storm water mitigation measures as required under related Division 01 Sections.
- 3.10 DAILY AND MONTHLY REPORTS
  - A. CONTRACTOR shall provide and maintain in the Project site office of CONTRACTOR, a daily sign in sheet for use by all employees of CONTRACTOR and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the site office of CONTRACTOR and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the daily construction report as set forth in Section 3.10 B.

- B. By the end of each workday, CONTRACTOR shall submit to Owner's Authorized Representative and IOR a daily construction report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages, strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies. CONTRACTOR shall also include on the daily construction report the above information for all Subcontractors at whatever tier.
- C. CONTRACTOR shall submit on a monthly basis the forms found in Sections 015000 certifying CEQA Mitigations and all forms as required within the approved Storm Water Pollution Prevention Plan (SWPPP).
- D. Postage & Delivery Costs: Postage and delivery costs for CONTRACTOR generated materials are the responsibility of the CONTRACTOR and shall not be charged to OWNER, regardless of whether the postage and/or delivery of CONTRACTOR generated materials resulted from a request and/or direction from OWNER.
- E. All other expendable field office support items specified elsewhere, including, but not limited to, furnishing toner cartridges, equipment maintenance, and bottled water, are to be supplied and paid for by CONTRACTOR. These costs are not to be deducted for the periodic replenishment of OWNER field office supplies.

### 3.12 CEQA MITIGATIONS – CONTRACTOR RESPONSIBILITIES

- A. Air Quality
  - MMIII-1. CONTRACTOR shall comply with and implement the applicable provisions of the most recently adopted South Coast Air Quality Management District Rule 403 and Rule 403 Implementation Handbook.
- B. Cultural Resources
  - CR-1 . CONTRACTOR shall notify OWNER in the event that an archaeological find or a potential archaeological find is discovered and shall cease construction activities in affected area. CONTRACTOR may resume construction activities only after receiving written notice from OWNER. For work cessation beyond five days on the critical path, CONTRACTOR will be entitled to additional days.
  - CR-2 CONTRACTOR shall notify OWNER in the event that human remains or possible human remains are discovered and shall cease construction activities in affected area. CONTRACTOR may resume construction activities only after receiving written

notice from OWNER. For work cessation beyond five days on the critical path, CONTRACTOR will be entitled to additional days.

- C. Noise
  - Noise-1. During construction, CONTRACTOR shall ensure that all construction is performed in accordance with City of Long Beach noise standards. No noise intensive construction or repair work shall be performed between the hours of 9:00 pm and 7:00 am on any weekday, nor before 8 am or after 6 pm on any Saturday, or at any time on Sundays or federal holidays.
  - Noise-2. CONTRACTOR shall ensure that all internal combustion powered equipment shall be equipped with properly operating mufflers and kept properly tuned to alleviate noise and pollution.
  - Noise-3. During construction, CONTRACTOR shall locate portable equipment as far as possible from nearby residents.
  - Noise-4. CONTRACTOR shall store and maintain equipment as far as possible from nearby residents.

END OF SECTION

# APPENDIX A

## CONSTRUCTION INDOOR AIR QUALITY (IAQ) PLAN

The Contractor shall complete and submit this Plan to the Owner's Authorized Representative no later than one hundred twenty (120) days after receipt of Notice to Proceed.

CONTRACTOR:

Name:	_Title:
Telephone:	_Fax:

Email:

I have read and understood and will implement the following Construction IAQ Plan.

Signature:	Date:

# I. CONSTRUCTION VENTILATION

List all project materials requiring Construction Ventilation per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.P7-P9 and EQ2.0.P14-P15 Attach additional sheets if necessary.	
Circle the f	ollowing Temporary Construction Ventilation approach to be used.
A	<ul> <li>Ventilation will be supplied via building's HVAC system.</li> <li>Return air grilles are sealed. Exhaust is provided via open windows or doors.</li> <li>All outside make-up air will be filtered (MERV 8) at the make-up source.</li> <li>HVAC in dust-producing areas will be turned off during dust-producing activities. Exhaust for dust-producing areas will be provided using temporary fans ducted directly to the outdoors via open windows and doors</li> </ul>
В	<ul> <li>Ventilation will be accomplished via open windows, temporary ducts, and/or temporary fans ducted directly to the outdoors.</li> <li>Supply air diffusers, return air grilles, and/or open ducts will be sealed. Make</li> <li>Return air grilles will be sealed.</li> </ul>
Required	<ul> <li>Ventilation will provide no less than three air changes per hour.</li> <li>Ventilation will be continuous for a period no less than 72 hours after completion of installation of VOC emitting materials.</li> <li>All filters used during Construction Ventilation will be replaced prior to commencing building flush-out and upon completion of building flush-out.</li> </ul>

## II. PRECONDITIONING

List all project materials requiring Preconditioning per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.10 Attach additional sheets if necessary.

Circle the following Preconditioning approach to be used.

A	Preconditioning will occur in dry and well-ventilated offsite location. Where is the offsite location?
В	Preconditioning will occur onsite. Check the applicable approach. □ Ventilation will be supplied via building's HVAC system. □Ventilation will be accomplished via open windows, temporary ducts, and tem
Required	<ul> <li>Containers and packaging will be removed prior to Preconditioning</li> <li>Preconditioning will occur for fourteen (14) continuous days prior to installation</li> </ul>

# III. SEQUENCING

List all project porous and fibrous materials requiring Sequencing consideration per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0 P11 Attach additional sheets if necessary	
Required	<ul> <li>Previously installed Porous or Fibrous Materials located in a room where VOC-Emitting Materials are to be installed will be protected with polyethylene vapor retarder. Polyethylene will not be removed until completion of a 72-hour ventilation period.</li> </ul>
	<ul> <li>Installation of interior finish materials will complete fourteen (14) days prior the commencement of building flush-out/</li> </ul>

# IV. PROTECTION

List all project materials requiring Protection per Specifications. Describe the specifics of the plan for protecting materials from dust and moisture during transportation, delivery, storage and construction. Attach additional sheets if necessary.

Required	<ul> <li>Weatherproof enclosures shall be provided to store and protect the materials from moisture sources. Materials shall be protected from rain and other moisture sources and, if resting on the ground, spacers shall used to allow air to circulate between the ground and the materials.</li> <li>Materials, including porous or Fibrous Materials, with visible microbial growth shall not be installed.</li> <li>Materials that are not defined as Porous or Fibrous, but with visible microbial growth, shall be decontaminated prior to installation. Lumber exhibiting a minor amount of "lumberyard mold" need not be discarded.</li> <li>Temporary ventilation will be provided during all dust producing activities. See Item I, Construction Ventilation. All supply air diffusers and return air grilles in the immediate vicinity of the dust producing activities will be sealed and the HVAC system turned off .</li> <li>Ductwork will be sealed during transportation, delivery, and construction.</li> </ul>

END OF SECTION 015000

### SECTION 015723 - STORM WATER POLLUTION CONTROL MEASURES

### PART 1 - GENERAL

- 1.01 General: The Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution.
  - A. Conduct and schedule operations to minimize or avoid muddying and silting channels, drains, and waters.
  - B. As required, obtain permits for erosion and water pollution control from the appropriate jurisdictional agency before starting Work.
  - C. Provide any necessary water pollution control devices to prevent, control, and abate water pollution, and implement good housekeeping pollution control measures to reduce the discharge of pollutants from work sites to the maximum extent practicable. These water pollution control devices include drains, gutters, slope protection blankets and retention basins and shall be constructed concurrently with other Work at the earliest practicable time.
  - D. Exercise care in preserving vegetation and protecting property, to avoid disturbing areas beyond the limits of the Work. Promptly repair any damage caused by Contractor operations.
  - E. Comply with the specific requirements based on acreage of disturbed soil.
  - F. Penalties: Failure to comply with this Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines of up to \$32,500 per day for each violation. Should the Owner be fined or penalized as a result of the Contractor failing to comply with this Section, the Contractor shall reimburse the Owner for any and all fines, penalties and related costs.
  - G. Notification and Report: If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.
  - H. The provisions of this Section describe minimum compliance and do not preclude other more stringent stormwater pollution control measures that may be required in the Contract.

### 1.02 Definitions

A. "Construction activity": Operations such as clearing, grading, disturbances to the ground such as stockpiling, or excavation that results in soil disturbances. If construction activity is part of a larger common plan of development, the amount

of disturbed soil is the total land area of disturbed soil that results under the common plan.

- 1.03 Payment: All costs for work required for compliance with this Section shall be included within the Bid Prices for other items of work.
- 1.04 Liabilities & Penalties:
  - A. Payment of penalties for non-compliance by CONTRACTOR shall be the sole responsibility of CONTRACTOR.
  - B. Compliance with the Clean Water Act pertaining is the sole responsibility of CONTRACTOR. Any fine against OWNER due to non-compliance by CONTRACTOR, OWNER shall recover all costs of the fine by appropriate OWNER Assessment.
- 1.05 Compliance Procedures
  - A. The project requires the Contractor to develop and implement the use of storm water "Best Management Practices" (BMP) and monitoring by a Qualified SWPPP Practitioner (QSP) to comply with all provisions of the developed SWPPP for the project by the Qualified SWPPP Developer. The Contractor must fulfill all National Pollutant Discharge Elimination System (NPDES) regulatory requirements including providing a project site specific SWPPP.
  - B. The QSP and QSD shall be certified by a State Water Board sponsored or approved training course.
  - C. The Contractor and any subcontractor involved in earthwork shall:
    - 1. Review the SWPPP.
    - 2. Indicate, in the SWPPP, the names of all key subcontractors involved in earthwork/ land disturbing activities.
    - 3. Ensure that all key site personnel involved in earthwork operations understand the requirements of the SWPPP.
    - 4. Maintain a copy of the Storm Water Pollution Prevention Plan on site at all times.
- 1.06 Unauthorized Discharge
  - A. The Contractor will ensure that no unauthorized discharges leave the site.
  - B. Failure to comply with this Specification Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines for each violation. Should the Owner be fined or penalized as a result of the Contractor failing to comply with this Section, the Contractor shall reimburse the Owner for any and all fines, penalties and related costs.
  - C. The Contractor shall notify the Owner of any discharges of other than storm water in accordance with the procedures contained in the CGP Order NO. 2009-009-DWQ.

- D. If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, immediately correct the problem and notify the inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective action taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.
- 1.07 Stormwater Pollution Prevention Plan
  - A. The BMPs contained in the Development Best Management Practices Handbook
     Part A, Construction Activities cover the following categories of construction activities:
    - 1. Site preparation/ earth removal
    - 2. Underground structures
    - 3. Aboveground structures
    - 4. Roadways, walkways and parking lots
    - 5. Planting and landscaping
  - B. Shall be written and amended by the Contractors Qualified SWPPP Developer (QSD).
  - C. The Contractors qualified SWPPP Practitioner (QSP) is required to oversee implementation of the BMPs necessary to comply with the general permit. A QSP is required to comply with:
    - 1. Develop Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event.
    - 2. Begin implementation of the REAP no later than 24 hours prior to the likely precipitation event.
  - D. The Contractor is responsible for complying with the following forms, procedures and requirements:
    - 1. Notice of Intent
      - a) The Contractor shall fill out, sign and date the Notice of Intent (NOI). Submission of the NOI is required for land disturbance as contained in the CGP Order No. 2009-009-DWQ. Before construction operations begin.
    - 2. Notice of Termination
      - a) Upon Completion of the final stabilization of the construction site, the Contractor shall file a Notice of Termination for the project, at the completion of the project.
    - 3. Retention of Records
      - a) Keep a copy of the SWPPP in a readily accessible location at the construction site from the commencement of construction activity until submission of the Notice of Termination (NOT) for storm water discharges associated with construction activity. Contractors with day to day operation control over SWPPP implementation shall have a copy of the SWPPP available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWPPP.
    - 4. Inspection and Monitoring Requirements

- a) Inspections and monitoring shall be conducted in accordance with CGP Order NO. 2009-009-DWQ.
- 5. Certification Requirements
  - a) The persons or firms responsible for maintenance and inspection of the erosion and sediment control measures shall adhere to the minimum requirements as specified in CGP Order NO. 2009-009-DWQ.
- E. Additional Permits
  - 1. The Contractor is required to adhere to all local regulations and obtain all necessary permits as required by the local jurisdictions.
- 1.08 Submittal
  - A. Submit, through Procore, qualifications and certifications of qualified SWPPP Practitioner (QSP) and develop QSD.
  - B. Forms and documents as required by SWPPP and the QSP.
  - C. Submit Stormwater Pollution Prevention Plan

#### PART 2 - PRODUCTS

- 2.01 Construction activity: Comply with the following minimum water quality protection requirements.
  - A. Retain eroded sediments and other pollutants on-site and do not allow transportation from the site by sheet flow, swales, area drains, natural drainage, or wind. Control slope and channel erosion by implementing an effective combination of best management practices (BMPs). Such BMPs include scheduling grading during non-rainy seasons, planting and maintaining vegetation on slopes and covering erosion-susceptible slopes.
  - B. Protect stockpiles of earth and other construction-related materials from being transported from the site by wind or water.
  - C. Properly store and handle fuels, oils, solvents, and other toxic materials to not contaminate the soil or surface waters, enter the groundwater, or be placed where they may enter a live stream, channel, drain, or other water conveyance facility. Protect all approved toxic storage containers from weather. Clean spills immediately and properly dispose of cleanup materials. Spills shall not be washed into live streams, channels, drains, or other water conveyance facilities. IF RAIN OR STORM WATER RUN OFF COMES IN CONTACT WITH POLLUTANTS (SUCH AS SOIL STABILIZERS, PAINT OR FLUID FROM VEHICLES) REPORT TO INSPECTOR IMMEDIATELY. CONTRACTOR WILL BE REQUIRED TO SAMPLE AND REMEDIATE CONTAMINATED WATER.
  - D. Do not wash excess or waste concrete into the public way or any drainage system. Retain concrete wastes on-site until they can be appropriately disposed of or recycled.

- E. Deposit trash and construction-related solid wastes in covered receptacles to prevent contamination of rainwater and dispersal by wind.
- F. Do not allow sediments and other materials to be tracked from the site by vehicle traffic. Stabilize construction entrance roadways to inhibit sediments from being deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.
- G. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the work site.
- H. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.
- I. When working in live streams, these are additional water pollution control requirements.
  - 1. Erect barriers sufficient to prevent muddying or polluting streams.
  - 2. Prior to removing materials from a flowing stream, use a stream bypass or other equivalent means to keep the flow in the stream free of the mud or silt from the removal operations.
  - 3. Avoid transporting materials across live streams. If not possible, the transportation operation must be designed to prevent materials from falling into the stream and cannot muddy the stream.
  - 4. Equipment may not be operated in a live stream or channel unless the Contractor can demonstrate to the Engineer's satisfaction that no other practical alternatives exist. The equipment must be designed to prevent materials from falling into the stream and cannot muddy the stream.
  - 5. Do not allow fresh portland cement or fresh portland cement concrete to enter the water flowing in streams, channels or drains.
  - 6. Do not allow material derived from the Work to be deposited in a live stream, channel or drain.

# PART 3 - EXECUTION

### 3.01 Maintenance

- A. To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction site. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued. Inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:
  - 1. Prior to a forecast storm;
  - 2. At 24-hour intervals during extended precipitation events;

- 3. After all precipitation, which causes runoff capable of carrying sediment from the construction site; and;
- Routinely, at a minimum of once every week during the rainy season (October 1<sup>st</sup> – April 30<sup>th</sup>) and once every month during non-rainy season (May 1<sup>st</sup> – September 30<sup>th</sup>).
- B. All temporary and/or permanent post-construction control measures shall be maintained and regularly inspected by the Contractor after all improvements are in place and accepted by the Owner. Temporary and/or permanent post-construction landscaping maintenance shall include but not limited to, watering, seeding, hydro-seeding, matting, slope stabilization, re-vegetation, and any other maintenance control measures recommended by the Owner to insure proper erosion control and plant growth.

END OF SECTION 015723

## SECTION 016010 - MATERIALS AND EQUIPMENT

### PART 1 – GENERAL

- 1.01 RELATED DOCUMENTS
  - A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division I Specifications, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "References" specifies the applicability of industry standards to products specified.
  - 2. Division 1 Section "Submittal Procedures" and "Construction Schedule" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
  - 3. Division 1 Section "Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

### 1.03 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," "structure," "finishes," "accessories," and similar terms. Such terms 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.
    - a. "Named Products" are items identified by the manufacture's product name, including make or model number or other designation, shown or listed in the manufacture's published product literature that is current as of the date of the Contract Documents.
  - 2. "Materials" are products substantially shaped, cut worked, mixed finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
  - 3. "Equipment" is a product with operation parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
# 1.04 SUBMITTALS

- A. Product List: Verify the list showing products specified in tabular form shown in the specifications, by signing and returning the Submittal Register. Include the generic names of products required. Add the manufacturer's name and proprietary product names for each item listed.
  - 1. Coordinate product list with the Contractor's Construction Schedule.
  - 2. Form: Prepare product list with the information on each item tabulated under the following column headings:
    - a. Submittal number per the submittal register.
    - b. Proprietary name, model number, and similar designations.
    - c. Manufacturer's name.
    - d. Installer's name and address.
  - 4. Initial Submittal: Within 15 days of the first Notice to Proceed, submit, through Procore, one electronic copy of all required submittals. Provide a written explanation for omissions of data and for known variations from Contract requirements.
  - 5. ARCHITECT Action: The Architect will respond in writing to Contractor within 3 weeks of receipt of the submittals. A review constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirements that products comply with Contract Documents.

## 1.05 QUALITY ASSURANCE

- A. Source Limitation: To the fullest extent possible, provide products of the same kind a single source.
  - 1. When specified product are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner consult with the Owner's Authorized Representative and the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Option: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
  - 1. Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other the subcontractors.

- 2. If a dispute arises between subcontractors over concurrently selectable, but incompatible products, the Contractor will determine which products shall be retained and which are incompatible and must be replaced.
- C. 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.
  - 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
    - a. Name of product and manufacturer
    - b. Model and serial number
    - c. Capacity
    - d. Speed
    - e. Ratings
- 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING
  - A. Deliver, store, and handle products according to the manufacture's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

# 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, new at the time of installation.
    - 1. Provide products completed with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
    - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- B. Product Selections Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selections include the following:
  - 1. Proprietary Specifications Requirements: Where Specifications name only a single product or manufacturer, and indicate "no substitutions" permitted, provide the product indicated. No substitutions will be permitted.
  - 2. Semi Proprietary Specifications Requirements: Where Specifications name two (2) or more products or manufacturers, provide one (1) of the products indicated. No substitutions will be provided.
    - a. Where Specifications specify products or manufacturers 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.
  - 3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract Requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
  - 4. Descriptive Specifications 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.
  - 5. Performance Specifications 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.
    - a. Manufacturer's recommendations may be contained in published product literature or by manufacturer's certification of performance.
  - 6. Compliance with Standards, Codes, and Regulations: Where Specifications only required compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
  - 7. Visual Matching: Where Specifications required matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
    - a. Where no product available within the specified category matches satisfactorily and/or complies with other specified requirements, comply with provisions of the Contract Documents

concerning "substitutions," for selecting the matching product in another product category.

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 complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selection.

# 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 at time of Substantial Completion.

END OF SECTION 016010

# SECTION 017000 - EXECUTION REQUIREMENTS

### PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
  - 10. Final Acceptance
- B. Related Sections:
  - 1. Division 1 Section "Submittal Procedures" for submitting surveys.
  - 2. Division 2 Section "Selective Demolition" for demolition and removal of selected portions of the building.
  - 3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 4. Division 7 Section "Through-Penetration Firestop Systems" for patching penetrations in fire-rated construction.

### 1.3 DEFINITIONS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Certified Surveys: Submit seven (7) copies signed by land surveyor or professional engineer. Provide both electronic CAD file and hard copy.
- D. Final Property Survey: Submit seven (7) copies showing the Work performed and record survey data. Provide both electronic CAD file and hard copy.

### 1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: Do not cut and patch structural elements unless detailed on structural drawings.
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Mechanical systems piping and ducts.
    - f. Control systems.
    - g. Communication systems.
    - h. Conveying systems.
    - i. Electrical wiring systems.
    - j. Operating systems of special construction.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

- a. Water, moisture, or vapor barriers.
- b. Membranes and flashings.
- c. Exterior curtain-wall construction.
- d. Equipment supports.
- e. Piping, ductwork, vessels, and equipment.
- f. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- E. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

#### 1.6 WARRANTY

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

### PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

### PART 3 - EXECUTION

# 3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework,

investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

- 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
- 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- 3. Contractor shall locate by tracing/potholing all existing utilities in the areas where new trenching/utilities are proposed to be provided to avoid conflict and causing damage to existing utilities. All cost for repair of utilities damaged during trenching or placement of new utilities shall be borne by the Contractor. Contractor shall sequence potholing in advance or ahead of each such activities and show sequence of potholing. Plan to be submitted to Owner's Authorized Representative for approval.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

# 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and the Owner's Authorized Representative and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field

measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information or interpretation to Architect according to requirements in Division 1 Section "Project Management and Coordination."
- E. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

## 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner's Authorized Representative and Architect promptly.
- B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

# 3.4 FIELD ENGINEERING

- A. Identification Identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

- 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Contractor shall coordinate work prior to field installation. Contractor will receive a 'no merit' response on any change request for failure by the Contractor or it's Sub-Contractors improperly or insufficiently coordinate their work with the drawings, specifications, manufacturer's installation instructions and other trades work.
- C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- E. 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.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

# 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 1 Section "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

- 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
  - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
  - b. Restore damaged pipe covering to its original condition.
- 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel working on Campus.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and other Contractors working on Campus.
  - 1. Construction Schedule: Inform the Owner's Authorized Representative of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify the Owner's Authorized Representative if changes to schedule are required due to differences in actual construction progress.
  - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work.

# 3.8 PROGRESS CLEANING

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

- 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
- 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
- 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
  - a. Utilize containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 1 Section "Construction Waste Management."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

# 3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components.

- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 1 Section "Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- 3.11 CORRECTION OF THE WORK
  - A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
    - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
  - B. Restore permanent facilities used during construction to their specified condition.
  - C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
  - D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
  - E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

# 3.12 FINAL ACCEPTANCE

A. Contractor shall satisfy or correct all deviations cited on the Deviation Notices issued by the Project Inspector and/or DSA Field Engineer before Substantial Completion can be established and before Final Acceptance. Any correction or remedy shall be at no cost to the Owner, but not limited to, design fees, labor, material and equipment cost.

END OF SECTION

# SECTION 017123 - FIELD ENGINEERING & SURVEY CONTROL

# PART 1 - GENERAL

### 1.01 SECTION INCLUDES

A. Surveying requirements for the Work.

# 1.02 RELATED SECTIONS

- A. Division 31: Earthwork
- B. Section 321216: Asphalt Pavement
- C. Section 334100: Storm Utility Drainage Piping
- D. Section 033000: Cast-in-Place Concrete
- E. Section 22 13 13: Sanitary Sewer

### 1.03 WORK INCLUDED

- A. Work by Contractor under this Section shall include, but may not be limited to the following.
  - 1. Establish and maintain additional horizontal and vertical control, lines and grades as required for construction layout survey.
  - 2. Survey and measurement necessary to establish design lines and grades shown on the Construction Documents.
  - 3. Document and field verify removal of foundations and other structures to the specified elevations.
  - 4. Document foundations and new and existing utilities to remain.
  - 5. Provide a certified as-built survey based upon the field measurements of all utilities and drainage work in accordance with the State of California Business and Professional Code Sec. 6735.6.
  - 6. All maps, plans, reports, descriptions or other documents issued by the Contractor's Licensed Land Surveyor shall be stamped and signed by the Registered Professional responsible for the work.
  - 7. Land Surveyor shall provide one (1) electronic copy and one (1) hard copy of the cut sheets upon completion of staking to the Owner.

## 1.04 SURVEY SERVICE

- A. Unless otherwise stated by the Architect or noted in the Special Provisions, the CONTRACTOR shall provide all surveying services.
- B. All surveying shall be performed by a State of California Licensed Land Surveyor or a Registered Civil Engineer authorized to practice Land Surveying in the State

of California or under his/her direction in conformance with the requirements of the Professional Land Surveyors Act.

# 1.05 QUALITY CONTROL

- A. The Contractor shall maintain a complete and accurate log of all control and survey work as it progresses.
- B. The District, or their consultants, reserves the option to check the Contractor's field survey measurements and calculations. Whether the District exercises this option or not, the Contractor shall perform accurate survey work meeting recognized industry standards.

### 1.06 PAYMENT FOR SURVEYING

A. The payment for surveying shall be included in respective items of work and shall include, but not to be limited to, construction staking, location and/or relocation of conflicting utilities, locating survey monuments, setting of survey monuments and center line ties, preparing and filing centerline tie sheets and Corner Records, locating Bench Marks and notifying the Office of the County Surveyor of same, professional office services and field calculations, and furnishing all labor, materials, tools, equipment and incidentals for doing all work involved. No additional compensation shall be allowed unless a separate bid item is provided.

### PART 2 - PRODUCTS (Not applicable)

### PART 3 - EXECUTION

- 3.01 SUBMITTALS
  - A. CONTRACTOR shall submit the name and address of the State of California licensed surveyor to ARCHITECT and OWNER'S AUTHORIZED REPRESENTATIVE including any changes as they may occur.
  - B. CONTRACTOR shall submit to ARCHITECT and/or OWNER'S AUTHORIZED REPRESENTATIVE copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying work.
  - C. Statement of Compliance: CONTRACTOR shall submit a statement of certification signed and sealed by Surveyor, counter-signed by CONTRACTOR indicating compliance with grade elevations, slopes and tolerances.
- 3.02 LAYOUT OF THE WORK
  - A. CONTRACTOR shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work,

surveyor shall, , locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

- B. All work under this contract shall be built in accordance with the lines and grades shown on the plans. Field survey for establishing these, and for the control of construction, shall be the responsibility of the Contractor. All such survey work including construction staking shall be done under the supervision of a California Licensed Land Surveyor or authorized Civil Engineer. Staking shall be done on all items ordinarily requiring grade and alignment, at intervals normally accepted by the agencies and trade involved.
- C. The CONTRACTOR shall be responsible for any errors in the finished work, and shall notify the District, in writing, within 24 hours, of any discrepancies, or design errors during the construction staking.
- D. Contractor shall immediately remediate any areas found not to meet specification requirements.

# 3.03 PERMANENT SURVEY MARKERS

- Prior to the start of construction, the Contractor's licensed Land Surveyor or Α. qualified Civil Engineer shall, in conformance with Section 8771 of the California State Business and Professions Code, locate all monuments (both of record and not of record), bench marks, and centerline ties within the construction zone, i.e., within one hundred feet of the construction activity. Additional ties to monuments shall be set when ties are missing (min. 4 ties per monument). The Contractor's Surveyor or qualified Civil Engineer shall prepare and submit for review to the City Engineer separate tie sheets and Corner Record sheets (monuments not of record shall have only tie sheets prepared). Corner Records shall conform to the County Engineers' Association of California's "Guide to the Preparation of Records of Survey and Corner Records" document as provided by the County Surveyor's Office. Upon review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Surveyor's Office. Certified Corner Records shall be filed with the City Engineer of the City that the work is being completed in.
- B. After construction and prior to final acceptance by the Owner of the construction project, the Contractor's land surveyor or qualified Civil Engineer shall re-survey all field monuments and centerline ties within the construction zone, prepare tie sheets and Corner Record sheets as indicated above, and file them with the City Engineer for review. After review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Land Surveyors Office, and file certified copies of the Corner Records with the City Engineer.
- C. All survey monuments removed or altered as a result of construction shall be reset, Corner Records filed with the County Surveyor's Office, and approved final Corner Records filed with the City Engineer. Centerline ties removed as a result of construction shall be reset and tie sheets filed with the City Engineer.

- D. The Land Surveyor shall provide a letter of certification for all monuments having four or more existing ties which are within 0.02 ft plus or minus of the original City tie sheet records. When several monuments and ties appear on one tie sheet and one of the ties has changed the Land Surveyor shall re-measure all of the ties and re-file a new tie sheet with the City as required herein.
- E. County of Los Angeles permanent and temporary bench marks within the construction zone shall be located by the surveyor, and the Contractor's Land Surveyor shall send a written notification of impending construction to the County of Los Angeles Surveyor's Office two weeks prior to construction.

# 3.04 SURVEY REQUIREMENTS

- A. Utilize a minimum of two Record Control points on the Project site, remote from the building area, referenced to data established by the survey control points.
  - 1. Re-establish the basis of bearings and benchmark as shown on the approved plans.
  - 2. All control to be tied to the basis of bearings and benchmarks.
- B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.
- C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.
- D. Provide grade stakes and elevations to construct over excavation and recompaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.
- E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.
- F. Provide stakes and elevations for grading, fill, and topsoil placement.
- G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- H. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.
- I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control

both over excavation and re-compaction and the final sub-grade elevation of the building pad.

J. Submit a certification, signed by the surveyor, confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01'. Building pad tolerance will be +- 0.10'.

# 3.05 ESTABLISHMENT OF GRADES IN HARDSCAPE AREAS

- A. All work shall conform to the lines, elevations, and grades shown on the Grading Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.
- B. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.
- C. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.
- D. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

### 3.06 STORM DRAIN & SANITARY SEWER PIPE INSTALLATION

A. All storm drain pipelines, sanitary sewer pipelines, trench drains, catch basins, cleanouts and drain inlets shall be staked by a licensed surveyor if slope of grade is less than 2% and a complete set of cut sheets shall be supplied to the Inspector. All construction staking shall be installed and verified for grade and alignment prior to the start of construction.

### 3.07 UTILITY BACKFILL

A. Prior to placing backfill, the Contractor shall perform as-built surveys based upon field measurements by the Land Surveyor to accurately record the installed depth, alignment, location of bends, valves, vaults, duct banks, manholes and all other items or conditions to provide an accurate record of all below–grade utilities. The field survey shall consist of Point number, Northing/Easting coordinates and Elevation (based on project datum), and limits of any structure, utility or other existing or new underground feature that will remain in place and be covered by the backfill.

#### 3.08 RECORD DRAWINGS

- A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for electronic copies (CADD and pdf) of the as built survey drawings. Deliver to OWNER'S AUTHORIZED REPRESENTATIVE and ARCHITECT, final "record" drawings of the original drawings and completed Work within specified tolerances.
- B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.
- C. Completed record drawing shall be signed and certified as correct and within specified tolerances by the licensed surveyor.
- D. Contractor to provide one (1) hard copy and one (1) electronic CADD copy of the completed record drawings certified by the licensed surveyor.
- E. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION 017123

# SECTION 017417 - CLEANING AND SITE APPEARANCE

#### PART 1 – GENERAL

- 1.01 DESCRIPTION
  - A. Principal work in this Section:
    - 1. Keep premises, adjacent private properties and public properties free from accumulations of waste, debris and rubbish caused by construction operations daily.
    - 2. Maintain construction area in a neat and workmanlike manner. Keep all tools, equipment, and materials stored in an organized and secure fashion. Avoid layouts or methods that create a public eyesore.
    - 3. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces.

### 1.02 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accord with State and local safety standards.
- B. Hazard Control
  - 1. Store volatile wastes in covered metal containers, and remove from premised daily.
  - 2. Prevent accumulation of wastes which create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.
  - 4. Prevent accumulation of waste that may attract rodents, insects, or other pests.
- C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
  - 1. Do not turn or bury rubbish and waste materials on project site.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains, or the Owner's waste containers. Store in containers with tight-fitting lids and remove to legal dump site.
  - 3. Comply with the Los Angeles County, State of California, or City of Long Beach, which ever applies, Stormwater Pollution Control Requirements for Construction Sites which require implementation of the NPDES standards and SCAQMD requirements. The cost of implanting these standards and adhering to the Stormwater Pollution Control Requirements must be included in the lump sump bid for the Project.

#### PART 2 – PRODUCTS

#### 2.01 MATERIALS:

A. Use cleaning materials which will not create hazardous to health or property and which will not damage materials. Use cleaning materials and methods recommended

by the manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning materials manufacturer.

### PART 3 – EXECUTION

#### 3.01 CLEAN-UP DURING CONSTRUCTION

- A. Keep premises, adjacent properties and public properties free from accumulations of waste materials and rubbish. Remove debris and dirt from public property promptly: sweep sidewalks and adjacent streets daily when soiled by work performed under this Contract. Maintain the existing landscaped areas within the fenced area of the construction site, including but not limited to weekly mowing and irrigation as required.
- B. Remove or paint over, as appropriate to the substrate, graffiti on the site or surrounding fence daily.
- C. Wet down materials and rubbish to settle dust and prevent it from blowing.
- D. At least once a week, or more often if required, dispose of waste materials, debris and rubbish off the site in a legal manner. Remove combustible materials such as paper and cardboard daily. Bury no such waste material and debris on the site. Burning of trash and debris on the site will not be permitted. All containers must be emptied as soon as they reach 75% of capacity.
- E. Provide on-site containers for collection of waste materials, debris and rubbish. Provide a collection can at each location used as an eating area. Pick-up all garbage daily.
- F. At the conclusion of each work day, Contractor will walk the site and collect all debris and rubbish and store all loose materials.
- G. Remove waste materials, debris and rubbish from site and legally dispose of at legal public or private dumpling areas off Owner's property. Location of dump for trash and debris and length of haul is to the Contractor's responsibility.
- H. Handle materials in a controlled manner with as few handlings as possible, do not drop or throw materials from heights.
- I. Owner's right to provide clean up at the Contractor's Expense.
  - 1. Should the Construction Manager, or Project Inspector determine that the Contractor is failing to maintain the site in a properly clean and safe manner, they will notify the Contractor that corrective action must be taken. Should the Contractors fail to clean the site after sufficient notification, the Owner reserves the right to have the site cleaned at the Contractor's expense.
  - 2. In the case of public or safety hazard, the Owner reserves the right to have the hazard corrected immediately at the Contractor's expense.
- J. Contaminated Earth:

- 1. Clean-up operations include the removal and disposal of earth contaminated or unsuitable for support of plant life in planting areas, and filing of resulting excavations with suitable soil.
- 2. Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, and similar materials, areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and areas that have been oiled, paved, or chemically treated.
- 3. Do not dispose of waste oil, solvents, paint, solutions, mortar, concrete of any construction material or like penetrating material by depositing or burying on the Owner's property.

# 3.02 FINAL SITE CLEAN-UP:

- A. In preparation of Substantial Completion or Occupancy conduct a thorough cleaning of all work.
- B. Before final inspection and after all construction activity is essentially complete, thoroughly clean the buildings, utilizing professional building cleaners. Items to be cleaned include, but are not limited to: all glass, plastic, doors, opening frames, grilles, trim, exposed nonferrous metal surfaces, floor covering, light fixtures and plates, plumbing fixtures and trim, and all finish surfaces throughout the construction. Thoroughly remove ink trademarks from all surfaces, Vacuum clean the buildings (s) and remove all spots, smears, dust, debris, hand prints and defacements of every sort, including those of vandals. Follow the recommendations of the manufacturer of the materials and items to be cleaned for all cleaning, polishing, and treatment such as waxing.
- C. Repair, patch and touch-up marred surfaces to specified finish to match adjacent surfaces.
- D. Also, before final inspection, thoroughly clean the entire site and put it into a neat, acceptable condition. Remove from the entire site all construction waste and unused materials, rubbish, loose rock and stones, excess earth, roots, weeds, and all debris of any description resulting from the Work. Hose down and scrub where necessary all new concrete and asphalt pavement and walks dirtied as a result of the Work. Thoroughly remove mortar droppings from concrete walks and other pavements.
- E. Keep project clean until Final Acceptance by the Owner.
  - 1. Should the Construction Manager or Project Inspector determine that the Contractor is failing to maintain the site in a properly clean and safe manner, they will notify the Contractor that corrective action must be taken. Should the Contractor fail to clean the site after sufficient notification, the Owner reserves the right to have the site cleaned at the Contractor's expense.
  - 2. In the case of public or safety hazard, the Owner reserves the right to have the hazard corrected immediately, at the Contractor's expense.

END OF SECTION 017417

# SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

### PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Recycling nonhazardous demolition and construction waste.
  - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
  - 1. Division 1 Section "Construction Facilities and Temporary Controls" for environmental-protection measures during construction.
  - 2. Division 2 Section "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

#### 1.3 DEFINITIONS

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

# 1.4 PERFORMANCE GOALS

- A. Salvage/Recycle Goals: Owner's goal is to salvage and recycle not less than 50 percent of nonhazardous demolition and construction waste including the following materials:
  - 1. Demolition Waste:
    - a. Asphaltic concrete paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Brick.
    - e. Concrete masonry units.
    - f. Wood studs.
    - g. Wood joists.
    - h. Plywood and oriented strand board.
    - i. Wood paneling.
    - j. Wood trim.
    - k. Structural and miscellaneous steel.
    - I. Rough hardware.
    - m. Roofing.
    - n. Insulation.
    - o. Doors and frames.
    - p. Door hardware.
    - q. Windows.
    - r. Glazing.
    - s. Metal studs.
    - t. Gypsum board.
    - u. Acoustical tile and panels.
    - v. Carpet.
    - w. Carpet pad.
    - x. Demountable partitions.
    - y. Equipment.
    - z. Cabinets.
    - aa. Plumbing fixtures.
    - bb. Piping.
    - cc. Supports and hangers.
    - dd. Valves.
    - ee. Sprinklers.
    - ff. Mechanical equipment.
    - gg. Refrigerants.
    - hh. Electrical conduit.
    - ii. Copper wiring.
    - jj. Lighting fixtures.
    - kk. Lamps.
    - II. Ballasts.
    - mm. Electrical devices.
    - nn. Switchgear and panel boards.
    - oo. Transformers.

- 2. Construction Waste:
  - a. Site-clearing waste.
  - b. Lumber.
  - c. Wood sheet materials.
  - d. Wood trim.
  - e. Metals.
  - f. Roofing.
  - g. Insulation.
  - h. Carpet.
  - i. Gypsum board.
  - j. Piping.
  - k. Electrical conduit.
  - I. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
    - 1) Paper.
    - 2) Cardboard.
    - 3) Boxes.
    - 4) Plastic sheet and film.
    - 5) Polystyrene packaging.
    - 6) Wood crates.
    - 7) Plastic pails.

### 1.5 SUBMITTALS

- A. Waste Management Plan: Submit one electronic copy of plan to Owner's Authorized Representative within 10 days of date established for the Notice to Proceed.
- B. Contractor shall submit weight tickets, bill of ladings, or tonnage reports of any waste materials sent out for recycling from a work site within the District to the Construction Manager on a monthly basis with the Pay Application submission.

### 1.6 INFORMATIONAL SUBMITTALS

- A. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- C. Qualification Data: For refrigerant recovery technician.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

# 1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements:
  - 1. Comply with hauling and disposal regulations of authorities having jurisdiction.
  - 2. Comply with applicable provisions in California Integrated Waste Management Act of 1989 (AB 939).
  - 3. Comply with applicable provisions in California Code of Regulations Title 14, Section 18700 et seq.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
  - 1. Review and discuss waste management plan including responsibilities of Design-Builder's Waste Management Coordinator.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.

### 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, siteclearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  - 1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.

- 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
- 4. Store components off the ground and protect from the weather.
- 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

## 3.3 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Break up and transport concrete to concrete-recycling facility.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Clean and stack undamaged, whole masonry units on wood pallets.
  - 2. Transport masonry to masonry-recycling facility.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Roofing: Separate organic and glass-fiber asphalt felts. Remove and dispose of nails, staples, and accessories.
- G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

- J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- K. Plumbing Fixtures: Separate by type and size.
- L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- M. Lighting Fixtures: Separate lamps by type and protect from breakage.
- N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panel boards, circuit breakers, and other devices by type.
- O. Conduit: Reduce conduit to straight lengths and store by type and size.

# 3.4 RECYCLING CONSTRUCTION WASTE

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

# 3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

# SECTION 017700 - CLOSEOUT PROCEDURES

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Project record documents submittal
  - 4. Operation and maintenance manual submittal
  - 5. Warranties.
  - 6. OWNER orientation and instruction
  - 7. Final cleaning.
- B. Related Sections:
  - 1. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
  - 2. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Division 1 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
  - 5. Divisions 2 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

- 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
- 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
- 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- 8. Complete startup testing of systems.
- 9. Submit test/adjust/balance records.
- 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- 11. Advise Owner of changeover in heat and other utilities.
- 12. Completion of Commissioning and addressing all commissioning items from the final report.
- 13. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- 14. Complete final cleaning requirements, including touchup painting.
- 15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- 16. Receive signed entire scope of work DSA form 6-PI from project Inspector of Record and signed entire scope of work DSA form 6-AE from the Architect of Record and the project design engineers of record.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the Owner's Authorized Representative and Project Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Authorized Representative will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner's Authorized Representative, that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for final completion.

# 1.4 PROJECT RECORD DOCUMENT SUBMITTAL

- A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for Owner's Authorized Representative or IOR and reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure IOR and Owner's Authorized Representative approval of project record documents.
- B. Record Drawings: Maintain, in accordance with specification 17839 Project Record Documents, one (1) electronic copy of the drawings and one (1) clean,

undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which 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 Drawings. Provide detailed and accurate field dimensions for 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. Date and number entries in the same format as submitted. Call attention to entry by a "cloud" around the affected areas.
- 2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
- 3. Utility location and depth below finished grade and above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
- 4. Note related Change Order or Construction Directive numbers where applicable. RFI submissions shall be referenced on each affected sheet, Drawing and Shop Drawing.
- 5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
- 6. Prior to Contract Completion of the Work, review and approval of the project record drawings by the CONTRACTOR and ARCHITECT is required. Prepare a final set of project record drawings using reproducible vellum. Submit final set of Record Drawings in pdf format and CADD/BIM, to Construction Manager for review and acceptance.
- C. Record Specifications: Maintain, in accordance with specification 17839 Project Record Documents, one (1) electronic copy of the specification and one (1) hard copy of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders or Construction Directives issued during construction.
  - 1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  - 2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
  - 3. Note related record document information with Product Data.

- 4. Prior to Contract Completion of the Work, submit record Specifications to OWNER records.
- D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.
  - 1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.
  - 2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.
  - 3. Prior to Contract Completion, submit complete set of record Product Data to OWNER records.
- E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet With OWNER'S AUTHORIZED REPRESENTATIVE at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with Owner's Authorized Representative instructions regarding delivery to OWNER storage area.
- F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Prior to the date of Contract Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit for OWNER records.
- G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OWNER records. Include the following types of information. All information contained in the Maintenance Manuals are also required in pdf. electronic format. PDF documents shall be readable, searchable and provide bookmarks to separate sections to properly organize the 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
- H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

### 1.6 OPERATION AND MAINTENANCE:

- A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
  - 1. Maintenance manuals
  - 2. Spare parts and materials
  - 3. Tools
  - 4. Lubricants
  - 5. Fuels
  - 6. Identification systems
  - 7. Control sequences
  - 8. Hazards
  - 9. Cleaning
  - 10. Warranties and bonds
  - 11. Maintenance agreements and similar continuing commitments
- B. As part of instruction for operating equipment, demonstrate the following procedures:
  - 1. Start-up
  - 2. Shutdown
  - 3. Emergency operations
  - 4. Noise and vibration adjustments
  - 5. Safety procedures

- 6. Economy and efficiency adjustments
- 7. Effective energy utilization
- C. Notice Of Termination: CONTRACTOR shall submit a Notice of Termination (NOT) to the local Regional Water Quality Control Board, RWQCB. Provide a copy of NOT to Owner's Authorized Representative.

### 1.7 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
  - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - 4. Submit pest-control final inspection report and warranty.
  - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

# 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or Contractor's comparable form.
  - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.

- c. Name of the Owner's Authorized Representative.
- d. Name of Architect.
- e. Name of Contractor.
- f. Page number.
- 4. Submit list of incomplete items in the following format:
  - a. Five paper copies of list, unless otherwise indicated. Architect will return two copies.

#### 1.9 WARRANTIES

- A. Submittal Time: Submit written warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with maximum allowable VOC levels of authorities having jurisdiction.

# PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, eventextured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - I. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
  - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- s. Leave Project clean and ready for occupancy.
- C. Final Cleaning: The Owner will install its furnishings and equipment following cleaning included in Section B above and before Final Acceptance. The Contractor shall include an additional final cleaning of all surfaces of furnishing, equipment, and the balance of the Project interior following installation of furnishings, equipment, etc. by Owner's vendor.
- D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- E. Construction Waste Disposal: Comply with waste disposal requirements in Division 1 Section "Construction Waste Management."

END OF SECTION 017700

# SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 4. Divisions 2 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

### 1.3 DEFINITIONS

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

# 1.4 CLOSEOUT SUBMITTALS

A. Initial Submittal: Submit one electronic pdf draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

- B. Final Submittal: Submit one electronic pdf copy of each manual in final form at least 21 days before final inspection. Owner's Authorized Representative will return copy with comments within 21 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit revised copy of each corrected manual within 15 days of receipt of Architect's comments.
  - 2. Provide an external hard drive with the capacity to hold four (4) Terabytes of Information to the Owner upon final completion that contains the finalized and approved manuals.

# 1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

# PART 2 - PRODUCTS

# 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is a clean copy of the original editable document printed to a ".pdf" file format and text searchable capable and organized in the same format as the hard copy.
- B. Organization: In electronic format, include a section and folder in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- C. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- D. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- E. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- F. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

- 2.2 MANUALS, GENERAL (ONE SCANNED ELECTRONIC COPY ALSO REQUIRED)
  - A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is searchable and organized in the same format as the hard copy.
  - B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
    - 1. Title page.
    - 2. Table of contents.
    - 3. Manual contents.
  - C. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
    - 1. Subject matter included in manual.
    - 2. Name and address of Project.
    - 3. Name and address of Owner.
    - 4. Date of submittal.
    - 5. Name, address, and telephone number of Design-Builder.
    - 6. Name and address of Architect.
    - 7. Cross-reference to related systems in other operation and maintenance manuals.
  - D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
    - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
  - E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
    - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
- 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
- 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

# 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.
  - 2. Flood.
  - 3. Gas leak.
  - 4. Water leak.
  - 5. Power failure.
  - 6. Water outage.
  - 7. System, subsystem, or equipment failure.
  - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  - 1. Instructions on stopping.
  - 2. Shutdown instructions for each type of emergency.
  - 3. Operating instructions for conditions outside normal operating limits.
  - 4. Required sequences for electric or electronic systems.
  - 5. Special operating instructions and procedures.

# 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions.
  - 2. Performance and design criteria if Design-Builder is delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.
  - 4. Equipment function.
  - 5. Operating characteristics.
  - 6. Limiting conditions.
  - 7. Performance curves.
  - 8. Engineering data and tests.
  - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.
  - 8. Required sequences for electric or electronic systems.
  - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

### 2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

#### PART 3 - EXECUTION

# 3.1 MANUAL PREPARATION

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

- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

# SECTION 017836 - WARRANTIES

#### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.
  - 1. Refer to the General Conditions for terms of the guarantee period for the Work.
- 1.02 RELATED SECTIONS
  - A. Section 016010: Materials and Equipment
  - B. Section 017700: Closeout Procedures

PART 2 - PRODUCTS (Not applicable)

### PART 3 - EXECUTION

### 3.01 WARRANTY REQUIREMENTS

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTRACTOR of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with CONTRACTOR.
- B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.
- C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.
- D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure or which must be removed and replaced to provide access for correction of warranted Work.

- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.
- F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.
- G. OWNER Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: Owner's Authorized Representative reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, Owner's Authorized Representative reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

### 3.02 SUBMITTALS

- A. Submit written preliminary warranties prior to Substantial Completion, and final warranties prior to Contract Completion. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.
  - 1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to ARCHITECT within fifteen (15) days of the Partial Use or Occupancy of the designated portion of the Work.
- B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to Owner's Authorized Representative, through the ARCHITECT, for approval prior to final execution.
  - 1. Refer to Divisions 02 through 32 for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: Prior to Contract Completion, compile two copies of each required final warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer.

Organize the warranty documents into an orderly sequence based on the Specifications.

- D. Once draft warranties are approved, provide an electronic copy, through Procore, of all warranties as well as one original "hard Copy" in a heavy-duty, commercialquality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11" (115 by 280 mm) paper.
  - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
  - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title and/or name, and name of CONTRACTOR.
  - 3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
- E. Contractor to provide a directory in electronic excel format and hard copy with information sorted by specification to list the following information, at a minimum: Specification Section, Description of Specification Section, Actual System or Work Installed, Subcontractor, Subcontractor Contact Person, Subcontractor Contact Person Phone Number, Subcontractor Contact Person e-mail address

END OF SECTION 017836

# SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings and Documents Provide Hard copy and electronic files in both of the following formats:
    - a. Readable and searchable PDF format
    - b. BIM (Revit, ArchiCAD, etc. to match files as provided by the Design Team.) and/ or CADD (to match files as provided by the Design Team.)
  - 2. Record Specifications Provide Hard copy, pdf format, and word document files.
  - 3. Record Product Data Provide Hard copy and pdf format.
- B. Related Sections include the following:
  - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 2 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set of corrected Record Transparencies and one set of marked-up Record Prints and electronic files with above information.
- B. Record Specifications: Submit three copies of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit three copies of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit three copies of each submittal.

# PART 2 - PRODUCTS

# 2.1 RECORD DRAWINGS

- A. Record Construction Working Drawings and As-Built PDF files: Maintain one set of PDF files of the Contract Drawings and Shop Drawings. This set shall be maintained continuously by the General Contractor with access rights for viewing by the Construction Manager, Architect of Record, Inspector of Record and any other group authorized by the Construction Manager or General Contractor.
  - 1. Preparation: Mark PDF files to show the actual installation where installation varies from that shown originally. Date each entry on the Drawings. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record PDFs. Contractor shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. Contractor shall store the electronic PDF files in a central web based location and allow viewing access to the Project team.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders. (ASIs, responses to RFIs, etc.)
    - I. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

- 4. Mark record sets with red-color. Use other colors to distinguish between changes for different categories of the Work at same location.
- 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Construction Manager determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
  - 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
  - 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  - 1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  - 2. Record PDFs: Organize Record PDFs and newly prepared Record Drawing PDFs into manageable sets. Include identification in each PDF file.
  - 3. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
  - 4. Record CADD Drawings: Organize CADD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CADD file.
  - 5. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.
- 2.2 Record As-Built Drawings:
  - A. As-Built Drawings: Drawings showing final as-built conditions of the project. The final BIM and CADD as-built drawings/model shall consist of one set of electronic BIM or CADD drawing files in the specified format, and one set of the approved working as-built drawings.
  - B. As-Built Drawings as Applies to BIM and CADD.
    - 1. It is the scope of this section to provide guidance to the Contractor on preparing as-built drawings for construction projects. An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not

have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

- C. Maintenance of As-Built Drawings
  - Provide timely updates of the as-builts, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the contract drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Provide this update on a weekly basis for the PDF drawings and on a quarterly basis for the BIM / CADD files. Provide confirmation that the asbuilts are up to date with the submission of the monthly project schedule. Contractor to review and provide written documentation or stamp each month signifying review / completeness that the as-builts are updated.
  - 2. If the Contractors fails to maintain the as-built drawings, the District will retain an amount from the monthly payment representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole, will be withheld until the Contractor submits acceptable as-built drawings and the District approves them.
  - 3. The marked-up set of PDF drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.
  - 4. Typically, room numbers shown on the contract drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.
  - 5. Indicate on the drawings the actual location, kinds and sizes of all subsurface utility lines. On the as-built drawings, show offset dimensions of each end run, including changes of direction by two permanently fixed surface features in order for the underground utility lines to be located in the future.
  - 6. Show valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record the average elevation of the top of each run or underground structure.
- D. As-Built Conditions that are Different from the Contract Drawings
  - 1. Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the contract drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in BIM or CADD format. Reference on the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing will reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected, clearly reflect options selected on final as-built drawings.
- E. Additional As-Built Information that Exceeds the Detail Shown on the Contract Drawings:
  - 1. These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after

the time of approved shop drawings. It is recognized that these shop drawing submittals revised to show as-built conditions will serve as the as-built record without actual incorporation into the contract drawings. Include fire protection details, such as wiring, piping, and equipment drawings.

F. The District will withhold the amount of \$50,000., or 1% of the total construction contract value, whichever is greater, until the final as-built drawing submittal has been approved by the District.

# 2.3 RECORD SPECIFICATIONS

- A. Preparation: This manual shall be maintained continuously by the General Contractor with access rights for viewing by the Construction Manager, Architect of Record, Inspector of Record and any other group authorized by the Construction Manager or General Contractor. Mark PDF files of the Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Contractor shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. Contractor shall store the electronic PDF files in a central web based location and allow viewing access to the Project Team.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  - 5. Note related ASIs, RFIs, Change Orders, Change Directives, Record Product Data, and Record Drawings where applicable.

# 2.4 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

# 2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of

the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

- 3.1 RECORDING AND MAINTENANCE
  - A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
  - B. Maintenance of Record Documents and Samples: Store Samples in the field office. Store Record Documents in PDF format on a shared web based location. apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in legible condition, protected from deterioration and loss. Provide access to the electronic Project Record Documents for Design Team, Construction Manager and the IOR's reference at all times.

END OF SECTION 017839

# SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
  - 2. Divisions 2 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit two complete training manual(s) for Owner's use.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

### 1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

- 1. Identification: On each copy, provide an applied label with the following information:
  - a. Name of Project.
  - b. Name and address of photographer.
  - c. Name of Architect.
  - d. Name of Construction Manager
  - e. Name of Design-Builder.
  - f. Date videotape was recorded.
  - g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- 2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

# 1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

### 1.6 COORDINATION

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

- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.
- D. Coordination of training for all systems requiring training noted within division 2 through 48 shall be scheduled to occur within a one (1) week period. Do not schedule any training until all systems are signed off by the project inspector and coordination agent.

# PART 2 - PRODUCTS

# 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Motorized doors, including overhead coiling doors, overhead coiling grilles and automatic entrance doors.
  - 2. Equipment, including projection screens, waste compactors, food-service equipment, appliances and other miscellaneous equipment.
  - 3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
  - 4. Intrusion detection systems.
  - 5. Conveying systems, including conveyor Equipment.
  - 6. Medical equipment, including medical gas equipment and piping.
  - 7. Laboratory equipment, N/A
  - 8. Heat generation, including boilers, feed water equipment, pumps, steam distribution piping and water distribution piping.
  - 9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
  - 10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
  - 11. HVAC instrumentation and controls.
  - 12. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, monitoring controls and motor controls.
  - 13. Packaged engine generators, including transfer switches.
  - 14. Lighting equipment and controls.
  - 15. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, AVIT Equipment and television equipment.
  - 16. Any Fire Alarm equipment, Monitoring equipment and Energy Management system.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

- 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Design-Builder is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
- 2. Documentation: Review the following items in detail:
  - a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
  - h. Monitoring Equipment
- 3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
  - g. Monitoring Equipment
- 4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - I. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
  - n. Monitoring Equipment

- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

### PART 3 - EXECUTION

# 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Provide overview of actual installation of system and overview of the contract documents. Note any deviations of the installed system from the contract documents during training.
- C. Set up instructional equipment at instruction location.

#### 3.2 INSTRUCTION

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

- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

- A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded or by dubbing audio narration off-site after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 017900

# SECTION 018601 - GENERAL ACOUSTICAL REQUIREMENTS

# PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.
- B. Division 01 Specification Sections including but not limited to the following:
  - 1. Section "Substitutions" for procedures and requirements related to requests for product substitutions.
  - 2. Section "Submittal Procedures" for procedures and requirements for submission of materials and products furnished for the work.
  - 3. Section "Quality Requirements" for quality assurance requirements.
  - 4. Section "Substitution Procedures" for requirements for submitting comparable products by listed manufacturers.

### 1.2 SUMMARY

- A. The provisions of this section apply to all other Divisions of the Project Manual.
- B. Includes the definitions of terms used in the Contract Documents which have acoustic significance related to Interior Room Acoustics, Sound Isolation, and Mechanical, Electrical, and Plumbing Noise and Vibration Control.
- C. Includes performance requirements which are to be met in order to comply with the established acoustic quality defined for the project.
- D. Reference definitions and abbreviations for acoustic elements shown in the Contract Documents.

### 1.3 RELATED SECTIONS

- A. Applicable portions of the Work under any Section of the Specifications are to be undertaken in conformance with the provisions of the acoustics requirements found in Divisions 7, 8, 13, 22, 23, and 26, including, but not limited to the following:
  - 1. Section 079200 "Acoustical Joint Sealants"
  - 2. Section 085673 "Acoustically Rated Window Assemblies"
  - 3. Section 134813 "Vibration Control Components"
  - 4. Section 134823 "Manufactured Sound Control Assemblies"
  - 5. Section 220548 "Vibration & Seismic Controls for Plumbing and Piping Equipment"
  - 6. Section 230548 "Vibration and Seismic Controls for HVAC Systems"

- B. Work requiring coordination with the sections named in Paragraph A is described in Divisions including, but not limited to the following:
  - 1. Division 3 Concrete
  - 2. Division 4 Masonry
  - 3. Division 5 Metals
  - 4. Division 6 Wood, Plastics and Composites
  - 5. Division 7 Thermal and Moisture Protection
  - 6. Division 8 Openings
  - 7. Division 9 Finishes
  - 8. Division 13 Special Construction
  - 9. Division 14 Conveying Equipment
  - 10. Division 22 Plumbing
  - 11. Division 23 Heating, Ventilating and Air Conditioning
  - 12. Division 26 Electrical

# 1.4 DEFINITIONS AND ABBREVIATIONS

- A. Interior Room Acoustics
  - 1. The terms 'Interior Room Acoustics' and 'Room Acoustics' are interchangeable and are defined as the measurable and subjective characteristics of sound from intentional sources within an Acoustic Volume as measured and/or perceived by listeners within the interior environment of the same Acoustic Volume.
- B. Sound Isolation
  - 1. The term 'Sound Isolation' refers to the exclusion or attenuation of unwanted sound from outside a given Acoustic Volume. Sources of external sound include, but are not limited to, activity in other rooms in the same building or adjacent buildings, and environmental noise such as traffic, aircraft, and sounds of the surrounding natural environment.
- C. Mechanical, Electrical, and Plumbing Noise and Vibration Control
  - 1. The terms 'Mechanical, Electrical, and Plumbing Noise and Vibration Control' and 'Noise and Vibration Control', and 'Noise Control' are interchangeable and refer to the attenuation of unwanted noise from systems and equipment internal to the building. In some cases, this term may also apply to equipment noise from adjacent buildings.
- D. Noise Criteria
  - 1. 'Noise Criteria' curves are defined as the maximum continuous sound pressure level permissible within a space as measured using a precision sound level meter on a slow or integration setting and denoted by octave band.
  - 2. Noise Criteria Curves establish a single-number rating for evaluating the

acceptability of a sound pressure spectrum according to the average person's hearing. Noise Criteria Curves and their related sound pressure equivalents for each frequency are described in the 2013 ASHRAE Handbook Fundamentals Volume.

- 3. Specified Noise Criteria for spaces in this project are to be achieved with all electrical and mechanical systems, balanced, certified by the Contractor, and operating at their design capacities in all operating modes defined by the Design Engineer. Reduction of airflow rates, changes in equipment operating points or other modifications which adversely alter other non-acoustic conditions are not considered acceptable means for achieving the specified Noise Criteria.
- E. Acoustically Critical Rooms
  - 1. An Acoustically Critical Room is defined as a room or space whose primary purpose involves critical listening and requires very low background noise due to building systems, a high level of isolation from external noise, and special construction to achieve the interior room acoustics goals.
  - 2. Rooms with a specified Noise Criteria of NC-25 and below are Acoustically Critical Rooms. The following rooms in this project are Acoustically Critical Rooms:
    - a. Auditorium and Stage
    - b. Performance Lab
    - c. Broadcast Studio, Video Control, and Audio Control
    - d. Black Box
    - e. Instrumental Rehearsal, Choral Rehearsal, Percussion Studio
    - f. Voice Studio and Control Booth
    - g. Radio Studios
    - h. Editing Bays
- F. Acoustically Sensitive Rooms
  - 1. An Acoustically Sensitive Room is defined as a room or space which requires special construction considerations to meet room acoustic, sound isolation or noise and vibration control requirements.
  - 2. Acoustically Sensitive Rooms are those rooms with a specified Noise Criteria from NC-26 to NC-35 inclusive, as are rooms containing mechanical and electrical equipment including, but not limited to transformers, dimmers, fans, pumps, compressors, chillers, and similar rotating or reciprocating equipment. The following rooms in this project are Acoustically Sensitive Rooms:
    - a. Circulation and storage space around the Acoustically Critical Rooms, including Sound Locks
    - b. Dance Studio A
    - c. Pilates Studio
    - d. Rehearsal Lab/Actor's Studio
    - e. Small Teaching Lab

- f. Computer Lab
- g. Lecture Hall
- h. Keyboard Studio
- i. Private Offices and Conference Room
- j. Applied Instruction Studios
- k. Small Practice Rooms
- I. Ensemble Studio and Combo Jazz Studios
- m. Dressing Rooms
- n. Elevator Equipment Room
- o. Mechanical Rooms
- p. Electrical/Audio Equipment Rooms
- G. Acoustic Volume
  - 1. An Acoustic Volume is defined as the overall volume of a room contained within an airtight and light-tight enclosure defined by the Contract Drawing structural floor slab, structural ceiling/roof slabs, walls and/or partitions which, unless noted otherwise, are continuous from floor or slab below to the roof or slab above. The Acoustic Volume of a room includes any and all spaces contiguous to the typically visible portion of the room, including those spaces located behind sound transparent or sound absorptive materials and those spaces, such as voids and plena above architectural ceilings, curtain and banner pockets, and chases, which are not normally visible to the user or patron. Each Acoustically Critical or Acoustically Sensitive Room is a fully-enclosed, individual Acoustic Volume, unless specifically noted otherwise.
  - 2. A closure is considered light-tight if no light can be seen through the closure from a 100- watt light bulb held 3 feet from the opposite side of the barrier. The construction is considered airtight if the noise reduction as measured following ASTM E-366 performed 1 foot from the closure does not deviate by more than 3 decibels from the noise reduction measured 10 feet from the closure.
  - 3. The Acoustic Volume of an Acoustically Critical or Sensitive Room includes all alcoves, closets, storage rooms and similar ancillary spaces that open into the designated room.
- H. Acoustically Isolated Construction
  - 1. Acoustically Isolated Construction consists of wall, floor, ceiling and other building components constructed utilizing resilient materials for the purpose of limiting airand structure-borne noise transfer to achieve a desired level of acoustic isolation between noise producing and noise sensitive spaces.
  - 2. Acoustically Isolated Construction for this project consists includes walls constructed with isolation clips, walls with resilient connections at slabs above, and resiliently suspended ceiling systems.
  - 3. Acoustically Isolated Construction is accomplished utilizing resilient architectural acoustic isolation materials. The acoustic intent of details which utilize architectural acoustic isolation materials is to avoid rigid connections across the entire extent of building components separated by resilient materials. Coordination is required by all trades to avoid rigid connections between isolated building components. The

location of Acoustic Isolation Joints (AIJ - a defined resilient separation boundary) are detailed in the drawings.

# I. Sound Lock

- 1. The Sound Lock is a Vestibule, Corridor or other entrance or exit-way immediately serving an Acoustically Sensitive Rooms. The door opening into the Acoustically Critical Room is defined as the 'inner' door and shall be free of panic hardware or closing latches. The door opening to the adjacent corridor or public space is defined as the 'outer' door of the Sound Lock. The fire rating of Acoustically Critical and Sensitive Rooms is continued to the outer door(s) of the Sound Lock which may utilize panic hardware.
- 2. A Sound Lock is an Acoustically Sensitive Room.

# 1.5 PERFORMANCE REQUIREMENTS

A. Design has been based on the following Noise Criteria (NC) by room type:

Auditorium/Stage, Performance Lab, Black Box	NC-25
Broadcast Studio (Video & Audio Control)	NC-20
Dance Studio and Pilates	NC-30
Instrumental/Choral/Percussion Rehearsal	NC-25
Small Teaching Lab, Rehearsal Studio	NC-30
Computer Lab, Lecture Hall, Keyboards Studio	NC-30
Radio Studios, Editing Bays	NC-20
Offices	NC-35
Open Workstations	NC-40
Sound Locks	NC-30
Auditorium & Black Box Control Rooms	NC-30
Practice Rooms/Instruction Studios	NC-30
Lobby	NC-40

# 1.6 SUBSTITUTIONS AFFECTING ACOUSTICALLY CRITICAL OR SENSITIVE ROOMS

A. The Contractor shall be responsible for receiving written acceptance from Architect and Acoustical Consultant for all changes, alternatives, variations or deviations from the Contract Documents which are necessary within Acoustically Critical and Sensitive Rooms.

- B. Non-complying changes, alternatives, variations or deviations from the Contract Documents within Acoustically Critical and Sensitive Rooms undertaken by the Contractor without written acceptance by the Acoustic Consultant, constitutes a change in Design. Corrective actions are to be taken by the Contractor such that the Room Criteria defined herein are met.
- C. Review and approval by the Acoustical Consultant shall be requested prior to the ordering, procuring or shipping of alternative products. Approval by the Acoustical Consultant shall be requested with sufficient lead time as required in Division 01, Section "Substitutions" and Section "Submittals" and shall allow no less than 10 days for review and comment by the Acoustical Consultant, in addition to the time necessary for ordering, procuring, shipping, installing and evaluating the proposed changes.

# PART 2 PRODUCTS

Not applicable

# PART 3 EXECUTION

- 3.1 GENERAL
  - A. Noise Criteria
    - 1. The noise levels will be measured by the project Acoustical Consultant following substantial completion and, as or if requested by the Owner, during the warranty period of the building and its equipment. The measurements shall be taken at locations coinciding with the locations of people or microphones during the normal use of the spaces for which Noise Criteria are established in the Contract Documents.
  - B. Acoustically Critical and Sensitive Rooms including their enclosing construction systems, (the "Acoustic Volumes"), shall be constructed to meet the following general requirements.
    - 1. Unless noted otherwise in the Drawings, enclose Acoustically Critical and Sensitive Rooms with wall construction that is continuous from the floor slab to the slab above. Seal all interfaces between materials with permanently resilient Acoustical Sealant.
    - 2. Seal all penetrations of Acoustically Critical and Sensitive Room enclosures with Acoustical Sealant and accessories in accordance with details included in the Drawings and as specified elsewhere in the Project Manual. Penetrations to be sealed include, but are not limited to, structural members, ductwork, piping, and conduit.
      - a. Notify the Architect and Acoustics Consultant, in advance, of atypical conditions for which details are not provided.

- b. Seal all electrical boxes serving Acoustically Critical and Sensitive Rooms with backbox putty if electrical boxes within the same partition cannot be spaced 3 feet or more from an electrical box serving an adjacent room.
- 3. Seal all wall, floor, ceiling, slab, deck and other abutments of construction materials and systems to an airtight and light-tight closure. Construction systems shall be continuous and free of holes, openings, cracks, gaps and missing wall, floor or ceiling surfaces. This condition applies to all surfaces, including those which are not visible or are part of a technical space or area above an architectural ceiling system.
- 4. Seal connections of door or window frames common to a wall within an Acoustic Volume to an airtight and light-tight condition using Acoustical Sealant. All doors of an Acoustic Volume shall be gasketed to an airtight and light-tight seal as specified. All doors of an Acoustic Volume shall be free of louvers and undercuts.
- 5. In cases where acoustic requirements and fire-rating requirements apply to the same condition, assemblies and materials that satisfy both must be selected.
- 6. Fire Rated structure defining the Acoustically Critical and Acoustically Sensitive Rooms shall continue to the exterior door of sound locks. Panic Hardware shall not be placed on the interior doors of Sound Locks.
- C. Acoustically Isolated Construction
  - 1. For structural integrity, the various sections of Acoustically Isolated Construction must be supported using connections including acoustic isolation materials in series with the structure as noted on the Contract Drawings.
  - 2. Conduits, pipes, ducts, structure, reinforcement bar and other building components which pass through or make contact with Acoustically Isolated Construction shall not be rigidly attached to said construction systems or components. Conduits, pipes, and ducts crossing or penetrating Acoustically Isolated Construction shall be installed per isolation details referenced in the documents for Acoustically Isolated Construction or Acoustically Isolated Spaces.
  - 3. Do not bridge the acoustically isolated construction with door or window systems in areas where isolated construction abuts non-isolated assemblies. Maintain continuity of the joint at these locations.
  - 4. Notify the Architect and Acoustics Consultant, in advance, of atypical conditions for which details are not provided.

# 3.2 TESTING, EVALUATION AND ACCEPTANCE PROCEDURES

- A. Upon Substantial Completion or prior to the expiration of the Warranty of the project, the Acoustical Consultant will perform acoustic measurements to establish the background noise level, acoustic isolation and room acoustics performance of the facility as established by the Contract Documents.
- B. If it is found that defective, improperly installed materials or product substitutions are responsible for reducing the performance requirements identified in the Contract Documents, materials shall be repaired or replaced by the Contractor as necessary to

meet the requirement of the design documents within the period of time between substantial completion and the end of the warranty period. Associated costs for said changes are the responsibility of the Contractor.

END OF SECTION 018601
# SECTION 018620 - TEST AND BALANCE

# PART 1 - GENERAL

- 1.01 SECTION INCLUDES
  - A. This Section specifies the requirements for test and balance of HVAC and related systems.
- 1.02 RELATED SECTIONS
  - A. Section 011000: Summary
  - B. Section 013300: Submittal Procedures
  - C. Section 013210: Construction Schedule
  - D. Section 017700: Closeout Procedures
  - E. Division 23 Heating Ventilating and Air Conditioning

# PART 2 - PRODUCTS (Not used)

# PART 3 - EXECUTION

# 3.01 DEFINITIONS AND APPLICABLE PUBLICATIONS

- A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, TABB, ASHRAE, ANSI and SMACNA.
  - 1. TAB: Testing, Adjusting and Balancing.
  - 2. TABB: Testing, Adjusting and Balancing Bureau.
  - 3. AABC: Associated Air Balance Council
  - 4. NEBB: National Environmental Balancing Bureau.
  - 5. OAR: OWNER'S Authorized Representative
  - 6. Project Inspector: Inspector of Record

# 3.02 QUALITY ASSURANCE

A. The test and balance agency shall be directly subcontracted to CONTRACTOR. The qualifications of the agency shall comply with Section 014000, Quality Requirements. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust and balance the heating, ventilating and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

- B. CONTRACTOR shall obtain services of an independent, qualified testing agency acceptable to Architect and Districts Commissiong Agent (if one is employed) to perform testing and balancing Work as specified and as follows:
  - 1. Agency shall be currently certified by either The Associated Air Balance Council (AABC), The National Environmental Balancing Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB). NEBB or TABB certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.
  - 2. Work shall be in accordance with the latest edition of the AABC, NEBB or TABB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.
- C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting and Balancing agenda.
- D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC or Section II of the NEBB or TABB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.
- E. Verification: The Test and Balance Agency shall recheck ten percent (minimum ten) of the measurements listed in the report. The locations shall be selected by Project Inspector. The recheck will be witnessed by Project Inspector. If twenty percent of the measurements that are retested differ from the report and are also out of the specified range, an additional ten percent will be tested. If twenty percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.
- F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by Project Inspector. When there are multiple air systems, a system selected by Project Inspector shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid and all test and balance work shall be repeated.

# 3.03 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five (5) commercial or industrial HVAC system TAB projects of similar type, size, and degree of difficulty

completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

- B. Submit, for approval, 6 copies of the Agenda as indicated in Section 3.06 to test and balance all mechanical and relevant plumbing systems.
- C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to Architect and/or Project Inspector indicating deficiencies in Work precluding proper testing and balancing of the Work.
- D. Final TAB Report: Submit the final TAB report for review by Architect and/or Project Inspector outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.
- E. Submit an AABC "National Project Performance Guaranty" or "NEBB Quality Assurance Certification" assuring the Project systems were tested, adjusted and balanced in accordance with the Specifications and AABC, NEBB or TABB National Standards.
- F. CADD drawings: Submit single line, multi-color CADD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed and CONTRACTOR installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked on the drawings to show final settings. CADD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed Work and the Contract Documents affecting the performance and longevity of the system.

# 3.04 GENERAL SCOPE OF WORK

- A. The general scope of Work shall include but not be limited to the following:
  - 1. Measure airflow rates of HVAC systems and make adjustments to achieve design airflow rates, tabulate results and submit reports.
  - 2. Measure water-flow rates of HVAC systems and make adjustments to achieve design water flow rates, tabulate results and submit reports.
  - 3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps and other related HVAC system components, tabulate results and submit reports.
  - 4. Measure sound levels in each conditioned space, tabulate results and submit reports.
  - 5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results and submit reports.

- 6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components
- 3.05 SPECIFIC SCOPE OF WORK
  - A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:
    - 1. Air Handling Units
    - 2. Air Conditioning Units
    - 3. Heating and Ventilating Units
    - 4. Heating and Cooling Coils
    - 5. Supply, Return, Relief and Exhaust Fans
    - 6. Outside Air and Return Air Plenums
    - 7. Outside Air Intakes
    - 8. All Supply and Return Ductwork
    - 9. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.
    - 10. Mixing Boxes and Variable Air Volume (VAV) boxes
    - 11. Reheat Coils (Electric or Hot Water)
    - 12. Exhaust Duct Systems
    - 13. Fire and Fire/Smoke Dampers
    - 14. Kitchen Hoods
    - 15. Heat Exchangers
    - 16. Chillers
    - 17. Boilers
    - 18. Chilled water, heating hot water pumps
- 3.06 TESTING, ADJUSTING AND BALANCING AGENDA
  - A. Provide proposed materials, methods, procedures, forms, diagrams and reports for test and balance Work.
  - B. Agenda to be completed by the test and balance agency and submitted to Architect and Project Inspector for review and approval.

- C. Agenda shall include one complete set of AABC, NEBB or TABB publications listed in Section 3.02, B, 2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic and uniform set of procedures.
- D. Agenda shall also include the following detailed narrative procedures, system diagrams and forms for test results:
  - 1. Specific standard procedures required and proposed for each system of the Work.
  - 2. Specified test forms for recording each procedure and for recording sound and vibration measurements.
  - 3. Systems diagrams for each air, water and steam system. Diagrams may be single line.
- E. In addition to information recorded for standard AABC, NEBB or TABB procedures, the following information is required:
  - 1. Fan Data
  - 2. System number, Location, Manufacturer, Model and Serial Number
  - 3. Fan wheel type and size
  - 4. Motor horse power, type and rpm
  - 5. Drive size, type, number of grooves, and open turns on Variable Pitch Drives
  - 6. Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity
  - 7. Fan design airflow and service (Supply, return, outdoor air or exhaust)

8. Fan static pressure, suction/discharge, static profile and static control point.

- F. The following traverse data is required:
  - 1. Traverse location, size of duct (inside dimensions), Area of duct in square feet
  - 2. Column for each hole traversed/lines for each reading
  - 3. Barometric pressure
  - 4. Temperature/Static Pressure in the duct

- 5. Actual CFM corrected to SCFM
- 6. Notes
- G. The following air distribution data is required:
  - 1. Room identification
  - 2. Outlet or intake balance sequence number
  - 3. Size of outlet or inlet
  - 4. AK Factor
  - 5. Design and Actual FPM and CFM
  - 6. Notes
- H. The following hydronic coil data is required:
  - 1. Air flow through the coil in CFM
  - 2. Dry bulb and wet bulb temperatures entering/leaving coil
  - 3. Enthalpy or total heat differences in BTU/lb.
  - 4. Capacity in BTU/hr at time of test
  - 5. Water temperature and pressure entering/leaving coil
  - 6. Flow (in GPM) through coil
  - 7. Air pressure drop across coil
  - 8. Water head drop across coil
  - 9. Notes
- I. The following DX coil data is required:
  - 1. Air flow through the coil in CFM
  - 2. Dry and wet bulb temperatures entering/leaving coil
  - 3. Enthalpy or total heat difference across coil in BTU/ lb.
  - 4. Capacity in BTU/hr at time of test
  - 5. Air pressure drop across coil
  - 6. Notes

- J. The following data is required for steam to water heat exchangers for heat and/or domestic generation:
  - 1. Exchanger identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Temperature entering/leaving unit
  - 4. Flow through unit in GPM
  - 5. Pressure drop through unit
  - 6. Entering steam pressure
  - 7. Notes
- K. The following electric heating coil data is required:
  - 1. Heating coil identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Amperage/Voltage on each phase
  - 4. Phase, kW and Stages
  - 5. Safety device installed
  - 6. Air pressure drop across coil
  - 7. Notes
- L. The following water-cooled chiller data is required:
  - 1. Identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Chilled water flow through evaporator in GPM
  - 4. Water temperature entering/leaving evaporator
  - 5. Pressure drop through evaporator
  - 6. Condenser water flow through
  - 7. Pressure drop through condenser
  - 8. Water temperature entering/leaving condenser
  - 9. Motor data, amps, volts, rpm, starter type, overload protection type, phase, hertz, nameplate, and actual measured kW input

- 10. Type of refrigerant
- 11. Notes
- M. The following cooling tower data is required:
  - 1. Identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Performance test results for rated capacity
  - 4. Water flow through the tower in GPM
  - 5. Water temperature entering/leaving tower
  - 6. Outside Air dry and wet bulb temperatures
  - 7. Motor data, amps, volts, phase, hertz, and kW input
  - 8. Starter size and type and heater size and capacity
  - 9. Water droplets leaving tower yes/no
  - 10. Water balanced across tower pans and basins
  - 11. Airflow across the tower within design rating according to fan curves
  - 12. Notes
- N. The following boiler and domestic water heater data is required:
  - 1. Performance test results for rated capacity
  - 2. Boiler identification number
  - 3. Nameplate data; manufacturer, model and serial number
  - 4. Water temperature entering/leaving the boiler
  - 5. Outside conditions: temperature, humidity, general cloud cover
  - 6. Barometric pressure
- O. The following air-cooled split system condensing unit data is required:
  - 1. Performance test results for rated capacity
  - 2. Unit identification number
  - 3. Nameplate data, manufacturer, model and serial number.
  - 4. Compressor nameplate and actual amps, volts, phase, and hertz

- 5. RPM of motors, where applicable
- 6. Refrigerant type
- 7. Suction/Discharge pressure when gauge installed
- 8. Number of stages
- 9. Low-pressure/High-pressure control setting
- 10. Condenser fan sequence stages
- 11. Crankcase heater watts (nameplate)
- 12. Hot gas bypass installed yes/no
- 13. SCFM Air Flow Measurement vs. Design CFM
- P. The following air-cooled split system heat pump data is required:
  - 1. Performance test results for rated heating and cooling capacities
  - 2. Unit identification number
  - 3. Nameplate data, manufacturer, model and serial number.
  - 4. Compressor nameplate and actual amps, volts, phase, and hertz
  - 5. RPM of motors, where applicable
  - 6. Refrigerant type
  - 7. Suction/Discharge pressure for both heating and cooling modes when gauge installed
  - 8. Number of stages
  - 9. Low-pressure/High-pressure control setting
  - 10. Condenser fan sequence stages
  - 11. Crankcase heater watts (nameplate)
  - 12. Hot gas bypass installed yes/no
  - 13. SCFM Air Flow Measurement vs. Design CFM
  - Q. The following sound test data is required:
    - 1. Area or location
    - 2. Sound level in dB(A) as specified in Section 3.19

- 3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the Project Inspector.
- 4. Plot corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.
- R. The following vibration test data is required:
  - 1. Equipment identification number
  - 2. Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators
  - 3. Measurements in mils defection and velocity in inches per second as specified per section XIV of this document
  - 4. Each measurement taken in horizontal, vertical, and axial planes as accessible.
- S. The following mixing damper leakage test data is required:
  - 1. Equipment identification number (unit, box, zone, etc.)
  - 2. Dry bulb temperature in the cold/hot (or bypass) deck
  - 3. Dry bulb temperature in the mixed air stream
  - 4. Calculated percent leakage
  - 5. Data above taken in the full cool and full heat (or bypass) mode
  - 6. Notes
- T. The following airflow station data is required:
  - 1. Station identification number
  - 2. Nameplate data including effective area
  - 3. Differential test pressure or velocity
  - 4. Calculated CFM
  - 5. Actual CFM (From Pitot tube traverse form)
  - 6. Read out CFM
  - 7. Notes
- U. The following unit heater data is required:
  - 1. Equipment identification number

- 2. Nameplate data; manufacturer, model and serial number
- 3. Test CFM (use manufacturer rated CFM if not ducted)
- 4. Heat test data per applicable procedure (hot water, electric, etc.)
- 5. Notes
- V. The following fan coil and unit ventilator data is required:
  - 1. Equipment identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Tested supply CFM or manufacturer rated CFM if not ducted
  - 4. Tested outside air in CFM
  - 5. Motor data and actual amps and volts
  - 6. Cooling/Heating test data
  - 7. Static pressure
  - 8. Notes
- W. The following kitchen hood data is required:
  - 1. Hood identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Pitot-tube traverse total air flow
  - 4. Exhaust and supply (when part of hood) CFM
  - 5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
  - 6. Face velocities
  - 7. Hood opening dimensions
  - 8. Notes (turbulence and flow patterns at the face and inside the hood)
- X. The following laboratory hood data is required:
  - 1. Hood identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Pitot-tube traverse total air flow

- 4. Exhaust and supply (when part of hood) CFM
- 5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
- 6. Face velocities
- 7. Hood opening dimensions
- 8. Notes (turbulence and flow patterns at the face and inside the hood)
- Y The following data for water-to-water heat exchangers for domestic and/or heating is required:
  - 1. Exchanger identification number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. GPM and Pressure drop through each side
  - 4. Capacity of each side
  - 5. Notes
- Z. The following pump data, including but not limited to, chilled water, heating hot water, cooling tower water, boiler feed, domestic hot water booster, domestic hot water circulation, sewage ejectors, sump pumps and domestic hot water booster is required:
  - 1. Pump number
  - 2. Nameplate data; manufacturer, model and serial number
  - 3. Motor data including nameplate data, actual amps, volts, RPM, horsepower, starter heater size and capacity
  - 4. Pump discharge and suction pressure along with total dynamic head in the following modes
  - 5. Shut-off head FT, Wide open Head FT and Final operating Head FT
  - 6. Final GPM Test plotted on a pump curve
  - 7. Notes
- AA. The following water flow station data is required:
  - 1. Station identification number
  - 2. Nameplate data; manufacturer, model, and serial number
  - 3. Design and actual GPM

- 4. Differential test pressure
- 5. Setting (open turns, degree, etc.) if required GPM
- 6. Notes
- BB. The following terminal box data is required:
  - 1. Box identification number
  - 2. Node, address or designation on system
  - 3. Box size
  - 4. Cooling CFM
  - 5. Minimum CFM (if applicable)
  - 6. Heating CFM (if applicable)
  - 7. Box fan amps and volts (if applicable)
  - 8. For DDC controlled boxes, record computer readout maximum, minimum, and heat, along with box correction factor for calibrating to true CFM
  - 9. Notes

# 3.07 PROCEDURES

- A. Schedule the Work of this Section in order for test and balance activities to be completed prProject Inspector to the date of Substantial Completion. CONTRACTOR shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested and balanced.
- B. PrProject Inspector to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air handling units and air conditioning units into a 100% outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of fourteen (14) days.
- C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prProject Inspector to completion of said designated phase.

## 3.08 FIELD EXAMINATION

- A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:
  - 1. Ensure that all water heating and water cooling systems have been flushed, cleaned, filled and high points vented
  - 2. Boilers, steam and hot water, are filled
  - 3. Refrigerant systems are fully charged with specified refrigerant
  - 4. Over-voltage and current protection have been provided for motors
  - 5. Equipment has been labeled as required
  - 6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required
  - 7. Operations and maintenance manuals have been supplied
  - 8. Controls manufacturer and boiler-burner representatives shall be available for consultation and supervision of adjustments during tests
  - 9. Verify that heating and cooling coil fins are cleaned and combed and air filters clean and installed
  - 10. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed and duct end caps are in place, fire and volume dampers are in place and open
  - 11. Automatic control systems are completed and operating
  - 12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.
- B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:
  - 1. OWNER operations
  - 2. Building safety and security policies. PrProject Inspector to any fire safety or security systems shutdown at any time during the Work, CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.
  - 3. Protecting furniture, computers, photocopiers, and other office equipment.
  - 4. Protecting classroom fixtures and equipment.

- 5. Concerns specific and unique to building related issues.
- 6. Downtime required for each AHU including projected time to return each portion of the building back to its normal occupancy temperature and humidity.
- 7. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

## 3.09 TEST AND BALANCE

- A. For each heating, ventilating, or air conditioning system specific for the project in hand the following shall be performed, recorded and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:
  - 1. Air Systems:
    - a. General
      - Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. Agency shall perform the following TAB procedures in accordance with AABC or NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.
    - b. Zone, Branch and Main Ducts:
      - 1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.
    - c. Supply Fans:
      - 1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys when required.
      - Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.
      - 3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.
      - 4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

- 5) Static Pressure: Test and record system static profile of each supply fan.
- 6) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.
- d. Return, Relief and Exhaust Fans:
  - 1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys where required.
  - 2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.
  - 3. Static Pressure: Test and record system static profile of each fan.
- e. VAV Systems:
  - 1) Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.
  - Identification: Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.
- f. Diffusers, Registers and Grilles:
  - 1) Tolerances: Test and balance each diffuser, grille, and register to within 5% of design requirements.
  - 2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.
- g. Coils: Air Temperature: Once airflow is set to acceptable limits, agency shall take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
- h. Duct Leakage Testing:
  - 1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.
  - 2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust and relief ductwork) shall be tested at one and one-half times (1-1/2)

design static pressure. All ducts shall demonstrate 5% leakage maximum (per CBC 2013 Sec 905.7.3.).

- i. Air handling units:
  - 1) Prepare pressure profile and show design and actual CFM (outside air, return air, and supply air).
  - 2) Measure and record each mode (minimum OA and 100% OA) where economizer cycle is specified.
  - 3) Record pressure drops of all components (coils, filters, sound attenuators, louvers, dampers, and fans) and compare with design values.
  - 4) Pressure profile and component pressure drops are performance indicators and are not to be used for flow measurements.
- j. System Pressure Profiles:
  - 1) Prepare pressure profiles from fan (supply, return exhaust) or air handling unit to extremities of system.
  - 2) As a minimum, show pressure at each floor, main branch, and airflow, measuring device.
  - Make pilot tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.
  - 4) Record residual pressures at inlets of volume controlled terminals at ends of system.
  - 5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.
- k. Fan speed adjustments and balancing for optimum acoustical performance:
  - 1) As the very first step, the speed of all fans (supply, return, exhaust, inside packaged equipment or air handling units) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the100% outdoor air position in systems with 100% outdoor air economizers.

- 2) The above adjustment shall be done with wet cooling coils where cooling coils are provided.
- 3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.
- 4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60% open or when the dampers start to generate audible noise.
- 5) CONTRACTOR shall provide the labor and materials for all dampers, pulleys and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.
- 2. Water Systems: CONTRACTOR shall confirm all equipment, piping, and coils have been filled and purged, strainers are clean and all balancing valves (except bypass valves) are set full open. Agency shall perform the following TAB procedures in accordance with the AABC, TABB or NEBB National Standards:
- B. Pumps:
  - 1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM.
  - 2. Measure and record suction and discharge pressures.
  - 3. Check pumps for proper operation. Pumps shall be free of vibration and cavitation.
  - 4. Current and Voltage: agency shall test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure pump motor is not in or above the service factor as published by the motor manufacturer.
  - 5. Adjust pump flow by adjusting and setting balancing valves, to obtain amperage reading on a clamp-on ammeter, to correspond to amperage indicated on pump's curves for required flow.
  - 6. Verify that the motor is not drawing more current than indicated on motor plate rating. When actual flows of primary pumps are found by test to vary more than 5% from specified amount, system shall be re-balanced to regulate flow within this tolerance. When a flow indicating device(s) is in circuit, it shall be used to verify pump flows.

- 7. When testing is completed, a pump capacity chart with pump number and location indicated shall be marked indicating operating point of pump on the curve. Chart shall then be included in the report.
- C. Chillers: (Start-up and initial commissioning by manufacturer only.)
  - 1. Test and balance chiller water flows to achieve maximum or design GPM.
  - 2. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure compressor motor is not in or above the service factor as published by the motor manufacturer.
  - 3. Test and record temperature and pressure profiles of chillers;
    - a. Inlet and outlet water temperature.
    - b. Inlet and outlet water pressure.
    - c. Evaporator temperature.
    - d. Condensing temperature pressure.
    - e. Purge pressure.
    - f. Oil temperature and pressure.
  - 4. Outside Climatic Conditions: Outside air DB, WB, atmospheric conditions, during temperature profile runs.
- D. Boilers: (Start-up and initial commissioning by manufacturer only.)Test and balance boilers only after test and balance of pumps have been completed. Boilers shall not be initially operated or tests performed with students or faculty on the Project site. Boilers shall be tested for the following:
  - 1. Heating Hot Water Boilers and Domestic Hot Water Boilers:
    - a. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure motor is not in or above the service factor.
    - b. Test and balance water flow through water boilers.
    - c. Test and record temperature and pressure profiles of water and/or steam boilers.
    - d. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
  - 2. Steam Boilers: Start-up and initial commissioning by manufacturer only.

- E. Heat Exchangers:
  - 1. Steam to Hot Water Heat Exchanger: Steam pressure, entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.
  - 2. Water to Water Heat Exchanger:
    - a. Primary Heating Water: Entering and leaving hot water temperatures, gpm flow, and pressure drop.
    - b. Secondary Heated Water: Entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.
- F. Coils:
  - 1. Tolerances: Test and balance all chilled-water and hot-water coils within 5% of design requirements.
  - 2. Verify the type, location, final pressure drop and GPM of each coil.
- G. System Mains and Branches including chilled water, heating hot water, cooling tower water, domestic hot water and domestic cold water:
  - 1. Balance water flow in pipes to achieve maximum or design GPM.
- H. Steam Heating Systems:
  - 1. Heating Coils: Steam pressure at coils, cfm, coil pressure drop, entering and leaving air DB temperatures.
  - 2. Boiler: Steam pressure, temperature and quantity of feed-water (see Testing and Adjusting procedures); boiler make, type, serial number and rated capacity; flue gas temperature at boiler outlet ahead of back-draft diverter; percent carbon dioxide in flue gas; condensate quantities and temperatures.
  - 3. Air Conditioning Units: (Start-up and initial commissioning by manufacturer only.)
    - a. Suction pressure and temperature.
    - b. Discharge pressure and temperature.
    - c. Amps and volts.
    - d. Make, type, and model of unit, capacity rating.
    - e. Ambient temperature: WB, DB
    - f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 3.09, A, 1, Air Systems.

- g. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.
- h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
- 4. Condensing and Refrigerating Units: (Start-up and initial commissioning by manufacturer only.)
  - a. Suction pressure and temperature.
  - b. Discharge pressure and temperature.
  - c. Amps and volts.
  - d. Make, type, and model of unit, capacity rating.
  - e. Ambient temperature: WB, DB
  - f. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.
  - g. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
- 5. Split System Heat Pump Units: (Start-up and initial commissioning by manufacturer only.)
  - a. Suction pressure and temperature.
  - b. Discharge pressure and temperature.
  - c. Amps and volts.
  - d. Make, type, and model of unit, capacity rating.
  - e. Ambient temperature: WB, DB
  - f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 3.09. A. 1. Air Systems.
  - g. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.
  - h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

- 6. MISCELLANEOUS:
  - a. Electric Heaters:
    - 1. Amperage.
    - 2. Voltage.
    - 3. Make, type, model, and name plate capacity rating.

# 3.10 VERIFICATION OF HVAC CONTROLS

- A. Agency shall verify in conjunction with CONTRACTOR all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stat's, and other safety devices.
  - B. CONTRACTOR shall verify all control components are calibrated and set for design operating conditions and intent.
- 3.11 TEMPERATURE TESTING
  - A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two (2) degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- 3.12 KITCHEN HOOD TESTING
  - A. Agency shall test and adjust hood total airflow by duct Pitot-tube traverse. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must be made in writing to Architect and subsequently appear on the appropriate data sheet. Face velocities shall be tested under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. CONTRACTOR shall set sash height on hoods to obtain face velocities within 20% of 100 feet per minute unless specified otherwise. Agency shall test and adjust exhaust airflows and make-up air flows to maintain design hood pressures and face velocities, and design room pressurization. Agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

# 3.14 BUILDING/ZONE PRESSURIZATION

A. Agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differentials. Positive/Negative area(s) supply air shall be set to design flow and exhaust air rates adjusted to obtain the required pressure differential(s).

# 3.15 FIRE AND SMOKE DAMPER TESTING

- A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of work.
- 3.16 LIFE SAFETY CONTROLS TESTING
  - A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of Work.
- 3.17 FINAL TABULATION
  - A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus 5% of design requirements.
  - B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for three (3) days. Boilers, forced air furnaces and chillers shall be started up far enough in advance to meet design conditions during period of testing.

# 3.18 VIBRATION TESTING

- A. Furnish instruments and perform vibration measurements if specified in Division 15. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans and motors.
- B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to ARCHITECT.

# 3.19 SOUND TESTING

- A. Perform and record sound measurements as specified in this section and if specified in Section 15070: Sound Vibration and Seismic Control. Take additional readings if required by ARCHITECT.
- B. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.
- C. Sound reference levels, formulae and coefficients shall be according to ASHRAE handbook, Current Systems Volume; Chapter: Sound and Vibration Control.

- D. Determine compliance with the Contract Documents as follows:
  - 1. Where sound pressure levels are specified as noise criteria or room criteria in Section 15070: Sound, Vibration and Seismic Control.
    - a. Reduce background noise as much as possible by shutting off unrelated audible equipment.
    - b. Measure octave band sound pressure levels with specified equipment "off".
    - c. Measure octave band sound pressure levels with specified equipment "on".
    - d. Use difference in corresponding readings to determine sound pressure due to equipment.

DIFF.:	0	1	2	3	4	5	9-10 or More
FACTOR:	10	7	4	3	2	1	0

Sound pressure level, due to equipment, equals sound pressure level with equipment "on" minus factor.

- e. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.
- 2. When sound power levels are specified:
  - a. Perform steps in Section 3.19, D, 1.a. through 1.d.
  - b. For indoor equipment: Determine room attenuating effect; i.e., difference between sound power level and sound pressure level. Determine sound power level will be sum of sound pressure level due to equipment, plus room attenuating effect.
  - c. For outdoor equipment: Use directivity factor and distance from noise source to determine distance factor, i.e., difference between sound power level and sound pressure level. Measured sound power level will be sum of sound pressure level due to equipment, plus distance factor.
- 3. Where sound pressure levels are specified in terms of dbA, measure sound levels using the "A" scale of meter. Single value readings will be used instead of octave band analysis.
- E. Where measured sound levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated.
- F. Measure and record sound levels in decibels at each diffuser, grille or register in occupied areas. Sound levels shall be measured approximately 5'-0" above floor on a line approximately 45 degrees to center of opening, on the "A" and "C" scales of a General Radio Company sound level meter, or similar instrument.

G. Report shall also include ambient sound levels of rooms in which above openings are located, taken without air-handling equipment operating. A report shall also be made of any noise caused by mechanical vibration.

END OF SECTION 018620

## SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

### PART 1 - GENERAL

- 1.1 SCOPE OF WORK
  - A. Demolish per drawings.

### 1.2 REQUIREMENTS

A. Prior to starting demolition, comply with requirements listed in related Division 1 Sections. Comply with Environmental Protection Agency (EPA) regulations and disposal regulations.

### 1.3 RELATED WORK

- A. Section 01 35 27 Site Safety
- B. Section 01 50 00 Construction Facilities and Temporary Controls
- C. Section 01 74 19 Construction Waste Management

### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

#### 3.1 UTILITIES

- A. In accordance with Section 01 14 00 Work Restrictions, locate, identify, disconnect, and cap off utility services to be demolished.
- B. Maintain and protect existing utilities to remain in service before proceeding with demolition, providing bypass connections to other parts of the building.

#### 3.2 SHORING AND BRACING

A. In accordance with Section 01 14 00 Work Restrictions and Section 01 41 00 Regulatory Requirements, provide and maintain shoring, bracing, or structural support to preserve building stability and prevent movement, settlement, or collapse.

#### 3.3 DEMOLITION

- A. In accordance with Section 01 50 00 Construction Facilities and Temporary Controls, conduct demolition operations and remove debris to prevent injury to people and damage to adjacent buildings and site improvements.
- B. Perform Work in such a manner as to prevent damage to existing facilities to remain or to be salvaged. Hazardous Work shall not be left standing or hanging but shall be knocked or pulled down to avoid damage or injury to employees or the public.

#### 3.4 PROTECTION

- A. In accordance with Section 01 73 29 Cutting and Patching, protect building structure or interior from weather and water leakage and damage.
- B. In accordance with Section 01 71 33 Protection of Adjacent Construction, protect remaining walls, ceilings, floors, and exposed finishes. Erect and maintain dustproof partitions. Cover and protect remaining furniture, furnishings, and equipment.
- 3.5 CUTTING AND PATCHING
  - A. In accordance with Section 01 73 29 Cutting and Patching.
  - B. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
  - C. Promptly patch and repair holes and damaged surfaces of building caused by demolition. Restore ex-posed finishes of patched areas and extend finish restoration into remaining adjoining construction.

#### 3.6 SALVAGE

- A. Items indicated to be removed and salvaged remain University's property. Remove, clean, and deliver to University's designated storage area or as directed by the University's Representative.
- B. Doors and door hardware: Contractor shall coordinate with University's Representative to arrange for door and door hardware salvage. Contractor shall remove any doors and door hardware not selected for salvage.

### 3.7 DISPOSAL

- A. In accordance with Section 01 74 00 Cleaning and Waste Management.
- B. Unless otherwise indicated, demolished materials become Contractor's property.
- C. Promptly remove demolished materials from University's property and legally dispose of them. Do not burn demolished materials.

#### 3.8 HAZARDOUS MATERIALS

- A. In accordance with Section 01 35 43 Environmental Procedures.
- B. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), lead, or other hazardous substances that have not been rendered harmless, Contractor shall immediately stop work in the area affected and report the condition to the University's Representative in writing. The work in the affected area shall not thereafter be resumed except by written agreement of University and Contractor if in fact the material is asbestos, PCB, lead, or other hazardous substances and has not been rendered harmless. The work in the affected area shall be resumed in the absence of asbestos, PCB, lead, or other hazardous substances, or when such materials have been rendered harmless.
- C. Disclose any hazardous substance or condition exposed during the work to the University's Representative for decision or remedy.

END OF SECTION 02 41 19

### SECTION 03310 - CONCRETE WORK

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### 1.2 SUMMARY

A. Extent of concrete work is shown on drawings.

#### **1.3** SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.
- B. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- C. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions.
- D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.

### 1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. ACI 301 "Specifications for Structural Concrete for Buildings".
  - 2. ACI 318 "Building Code Requirements for Reinforced Concrete".
  - 3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".
  - 4. California Building Code.
- B. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- **1.5** PROJECT CONDITIONS

- A. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- B. Protect adjacent finish materials against spatter during concrete placement.

### PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
  - Use plywood complying with U.S. Product Standard PS-1"B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Forms for Cylindrical Columns and Supports: Metal, fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.
- D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2" to surface.
  - 1. Provide ties which, when removed, will leave holes not larger than 1" diameterin concrete surface.

#### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, deformed, Grade as specified on structural drawings, except ASTM A706, Grade 60 where bars are to be welded or where specified on the drawings.
- B. Steel Wire: ASTM A82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A185, welded steel wire fabric.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

- 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

### 2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Use one brand of cement throughout project.
- C. Fly ash may be blended with cement provided not more than 15% of the total blend contains fly ash.
- D. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
- E. Do not use fine or coarse aggregates containing spalling-causing deleterious substances.
- F. Lightweight Aggregates: ASTM C 330.
- G. Water: Drinkable.
- H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Sika Aer"; Sika Corp.
    - b. "MB-VR or MB-AE"; Master Builders.
    - c. "Darex AEA" or "Daravair"; W.R. Grace.
- I. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "WRDA Hycol"; W.R. Grace.
    - b. "Pozzolith Normal"; Master Builders.
    - c. "Plastocrete 160"; Sika Chemical Corp.
- J. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "WRDA 19" or "Daracem"; W.R. Grace.
    - b. "Super P"; Anti-Hydro.

- c. "Sikament"; Sika Chemical Corp.
- d. "Rheobuild"; Master Builders.
- K. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1 percent chloride ions.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Pozzolith High Early"; Master Builders.
- L. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Pozzolith Retarder"; Master Builders.
    - b. "Daratard"; W.R. Grace.
    - c. "Plastiment"; Sika Chemical Co.
- M. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

# 2.4 RELATED MATERIALS

- A. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- B. Waterstops: Provide flat, dumbbell type or center-bulb type waterstops at construction joints and other joints as indicated. Size to suit joints.
- C. Rubber Waterstops: Corps of Engineers CRD-C 513.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
    - a. The Burke Co.
    - b. Progress Unlimited.
    - c. Williams Products.
    - d. Edoco Technical Products.
- D. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C572.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
    - a. AFCO Products.
    - b. The Burke Co.
    - c. Edoco Technical Products.
    - d. Greenstreet Plastic Products.

- e. Harbour Town Products.
- f. W.R. Meadows.
- g. Progress Unlimited.
- h. Schleigel Corp.
- i. Vinylex Corp.
- E. Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.
- F. Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:
  - 1. Polyethylene sheet not less than 10 mils thick.
- G. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. Non-metallic: "Sika Grout 212"; Sika Corp. "Five Star Grout"; U.S. Grout Corp.
    - b. Metallic: Not allowed.
- H. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2lbs. of fluosilicates per gal.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Saniseal"; Master Builders.
    - b. "Burk-O-Lith"; The Burke Co.
- I. Non-slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rust-proof, and non-glazing, and is unaffected by freezing, moisture, and cleaning materials.
- J. Colored Wear-Resistant Finish: Packaged, dry, combination of materials, consisting of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, non-fading mineral oxides, interground with cement. Color as selected by Architect, unless otherwise indicated.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Colorcron"; Master Builders.
- K. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

- L. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.
- M. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq.cm. when applied at 200 sq.ft./gal.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. "Masterseal"; Master Builders.
    - b. "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
    - c. "J-20 Acrylic Cure"; Dayton Superior.
    - d. "Spartan-Cote"; The Burke Co.
- N. Bonding Compound: Polyvinyl acetate or acrylic base.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. Acrylic or Styrene Butadiene:

"J-40 Bonding Agent"; Dayton Superior Corp. "Acrylic Bondcrete"; The Burke Co. "Daraweld C"; W.R. Grace

- O. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Thiopoxy"; W.R. Grace. "Sikadur Hi-Mod"; Sika Chemical Corp. "Patch and Bond Epoxy"; The Burke Co.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

- A. An approved Testing Laboratory shall prepare design mixes for each type and strengthof concrete which shall be certified by a registered Civil Engineer licensed in California. Refer to General Notes on structural drawings for additional mix design requirements.
- B. Submit written reports to Architect and Structural Engineer for each proposed mixdesign at least 14 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Structural Engineer.
- C. Admixtures:

- 1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
- 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg. F (10 deg. C).
- 3. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.
- 4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within following limits:
  - a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:

4.5 percent (moderate exposure); 5.5 percent (severe exposure) 1-1/2" max. aggregate. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) 1" max. aggregate.

5.0 percent (moderate exposure); 6.0 percent (severe exposure)3/4" max. aggregate.

5.5 percent (moderate exposure); 7.0 percent (severe exposure) 1/2" max. aggregate.

- b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure):
  2 percent to 4 percent air.
- c. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
- d. Slump Limits: Proportion and design mixes to result in concrete slumps as specified on structural drawings.
- e. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
- f. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

# PART 3 - EXECUTION

- 3.1 GENERAL
  - A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.
- 3.2 FORMS
  - A. Design, erect, support, brace, and maintain formwork to support vertical and lateral,

static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

- B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, orrubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

#### 3.3 VAPOR RETARDER INSTALLATION

- A. Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour.
- B. Lap joints 6" and seal with appropriate tape.
- C. After placement of moisture barrier, cover with granular material and compact to depth as shown on drawings.

#### 3.4 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

- 1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- F. As required, reinforcement shall be bent cold prior to placement.

### 3.5 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.
- D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.
- E. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns. Use saw cuts 1/8" x 1/4 slab depth or inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.
- F. Form contraction joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
  - 1. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- G. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays,
third-bays).

1. Joint sealant material is specified in Division-7 sections of these specifications.

## 3.6 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
- B. Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
- C. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

## 3.7 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact within-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

## 3.8 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
  - 1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spatteringduring placement.
- B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to

avoid segregation.

- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
- H. Consolidate concrete during placing operations so that concrete is thoroughlyworked around reinforcement and other embedded items and into corners.
- I. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- J. Maintain reinforcing in proper position during concrete placement operations.
- K. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
- L. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27degC) at point of placement.
- M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
- N. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- O. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- P. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
- Q. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel

temperature will not exceed the ambient air temperature immediately before embedment in concrete.

- R. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
- S. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

## 3.9 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment.
- D. Combine one-part portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.
- E. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fillsmall holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- F. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

## 3.10 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
  - After placing slabs, plane surface to tolerances for floor flatness (F) of 15 and floor levelness (F) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bedterrazzo,

and as otherwise indicated.

- After screeding, consolidating, and leveling concrete slabs do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both, consolidate surface with power-driven floats, or by hand-floatingif area is small or inaccessible to power units. Check and level surface plane to tolerances of F 18 - F 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
  - After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of F 20 - F 17. Grind smooth surface defects, which would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water (parts of hardener/water as follows), and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat and allow 24 hours for drying between coats.
  - 1. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.
  - 2. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.
- G. Colored Wear-Resistant Finish: Provide colored wear-resistant finish to monolithic slab surface indicated.
  - 1. Apply dry shake materials for colored wear-resistant finish at rate of not less than 60 lbs. per 100 sq. ft., unless greater amount is recommended by material manufacturer.
  - 2. Immediately following first floating operation uniformly distribute approximately 2/3 of required weight of dry shake material over concrete surface, and embedby

means of power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material at right angles to first application, and embed by power floating.

3. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry shake hardener manufacturer. Apply curing compound immediately after final finishing.

## 3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Cure concrete in accordance with ACI 308 recommendations.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 and ACI 308 procedures. Avoid rapid drying at end of final curing period.
- D. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
- E. Provide moisture curing by following methods.
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Continuous water-fog spray.
  - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- F. Provide moisture-cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- G. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:
  - 1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- H. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing,

dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

- I. Curing Formed Surfaces: Cure formed concrete surfaces, including under sides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- J. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- K. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.
- L. Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

# 3.12 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F(10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained. Comply with ACI 318 Section 6.2.1 for removal of forms.
- B. Formwork supporting weight of concrete, such as beams, soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
  - 1. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

# 3.13 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

# 3.14 MISCELLANEOUS CONCRETE ITEMS

Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. Grout base plates and foundations as indicated, using specified non-shrink grout.
- E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.

# 3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
- B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- C. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
- H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- I. Correct low areas in unformed surfaces during or immediately after completion of surface

finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

- J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one-part portland cement to 2-1/2 parts fine aggregate passing a No.16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- L. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.
- M. Repair methods not specified above may be used, subject to acceptance of Architect.

# 3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Owner will employ a testing laboratory to perform tests and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
- C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
  - 3. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.
  - 4. Compression Test Specimen: ASTM C 31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens, except when field-cure test specimens are required.
  - 5. Compressive Strength Tests: ASTM C 39; one set for each 150 cu. yds. placed and a minimum of one set for each concrete class placed in any one day; one specimen tested at 7 days; two specimens tested at 28 days.

- 6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- 7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
- D. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name, number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

# SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Wood blocking and nailers.
  - 2. Plywood backing panels.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.5 INFORMATIONAL SUBMITTALS

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

### 1.6 QUALITY ASSURANCE

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

## 1.7 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

## 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Dress lumber, S4S, unless otherwise indicated.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flamespread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all miscellaneous carpentry unless otherwise indicated.

## 2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
  - 1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
  - 2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
  - 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
  - 4. Eastern softwoods, No. 2 Common grade; NELMA.
  - 5. Northern species, No. 2 Common grade; NLGA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 PLYWOOD BACKING PANELS

A. Gallery Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

## 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
  - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
  - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.
- Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

# 3.2 WOOD BLOCKING AND NAILER INSTALLATION

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

END OF SECTION 06 10 53

# SECTION 062023 - INTERIOR FINISH CARPENTRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior base.
  - 2. Interior trim.
- B. Related Requirements:
  - 1. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Sustainable Design Submittals:
  - 1. Product Data: For installation adhesives, indicating VOC content.
  - 2. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
  - 3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and finish specified.

## 1.4 DELIVERY, STORAGE, AND HANDLING

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

### 1.5 FIELD CONDITIONS

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

# PART 2 - PRODUCTS

## 2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
  - 1. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

## 2.2 INTERIOR TRIM

- A. Hardwood Lumber Trim or Base for Transparent Finish Stain or Clear Finish (B-03 & B-04):
  - 1. Species and Grade: White oak; NHLA A Finish.
  - 2. Maximum Moisture Content: 10 percent.
  - 3. Finger Jointing: Not allowed.
  - 4. Gluing for Width: Not allowed.
  - 5. Face Surface: Surfaced (smooth).
  - 6. Matching: Selected for compatible grain and color.
- B. Wood Veneer (WD-01)
  - 1. Basis of Design: Dooge Veneers, Phone: 616-698-6450 Recon Classic Rift White Oak
  - 2. Or equal.

### 2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, bolts, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

- B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less.
  - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

# 2.4 FABRICATION

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

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

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

## 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

- 1. Use concealed shims where necessary for alignment.
- 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
- 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
- 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
- 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

## 3.4 STANDING AND RUNNING TRIM INSTALLATION

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

## 3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.
  - 1. Install with uniform tight joints between panels, unless otherwise indicated on drawings.
  - 2. Anchor paneling to supporting substrate with concealed panel-hanger clips.

## 3.6 ADJUSTING

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

## 3.7 CLEANING

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

# 3.8 PROTECTION

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

END OF SECTION 062023

# SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
  - A. Section Includes:
    - 1. Plastic-laminate-clad architectural cabinets.
    - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminateclad architectural cabinets that are not concealed within other construction.
  - B. Related Requirements:
    - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
    - 2. Section 135200 "Seismic Requirements for Non-Structural Components."

# 1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

## 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

# 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and attachment details.

- 2. Show large-scale details.
- 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- 4. Show locations and sizes of cutouts and holes for items installed in plasticlaminate architectural cabinets.
- 5. Apply AWI Quality Certification Program label to Shop Drawings.
- 6. Indicate seismic bracing and fastening requirements.
- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.
- 1.6 INFORMATIONAL SUBMITTALS
  - A. Qualification Data: For manufacturer.
  - B. Product Certificates: For each type of product.
  - C. Field quality-control reports.
- 1.7 CLOSEOUT SUBMITTALS
  - A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- 1.8 QUALITY ASSURANCE
  - A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
    - 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
  - B. Installer Qualifications: Manufacturer of products.
  - C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
    - 1. Build mockups of typical architectural cabinets as shown on Drawings. If not indicated, provide mockup of one base cabinet and one wall cabinet minimum.
    - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

# 1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in

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

# 1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

# PART 2 - PRODUCTS

# 2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
  - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Custom.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
- F. Laminate Cladding for Exposed Surfaces (PL-01 & PL-02):
  - 1. Horizontal Surfaces: Grade HGS.
  - 2. Vertical Surfaces: Grade HGS.
  - 3. Edges: PVC edge banding, 1-mm thick, matching laminate in color, pattern, and finish.

- G. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
    - a. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
  - 2. Drawer Sides and Backs: Solid-hardwood lumber.
  - 3. Shelves: Solid-hardwood lumber.
  - 4. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As indicated on Sheet A12.01 Finish Schedule, or approved equal.

# 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
  - 1. Particleboard: ANSI A208.1, Grade M-2.
  - 2. Softwood Plywood: DOC PS 1.

# 2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

- B. Operable parts for all accessible casework shall comply with CBC Section 11B-309.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- D. Pulls (HW-01): Schwinn Group, 2334/128 Handle, Sheet A13.0 Finish Schedule for color selections.
- E. Adjustable Shelf Standards and Supports (SB-01): KNAPE & VOGT 87/186/187 STEEL SERIES, 87/186/187 STEEL SERIES.
- F. Drawer Slides: BHMA A156.9.
  - 1. Grade 1 and Grade 2: Side mounted.
    - a. Type: Full extension.
    - b. Material: Zinc-plated steel with polymer rollers.
  - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zincplated-steel ball-bearing slides.
  - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
  - 4. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
  - 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
  - 6. For computer keyboard shelves, provide Grade 1HD-100.
  - 7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
- K. Exposed Hardware Finishes: As indicated on Sheet A12.01 Finish Schedule or approved equal.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

# 2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

# 2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
  - 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

# PART 3 - EXECUTION

# 3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

# 3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
  - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

# 3.3 FIELD QUALITY CONTROL

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

# 3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

# SECTION 07 84 13 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.
- B. Related Requirements:
  - 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

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

#### 1.5 INFORMATIONAL SUBMITTALS

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

## 1.6 CLOSEOUT SUBMITTALS

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

### 1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

### 1.9 COORDINATION

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

### PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Hilti, Inc.
    - c. Specified Technologies, Inc.
    - d. Tremco, Inc.

- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
  - 1. Permanent forming/damming/backing materials.
  - 2. Substrate primers.
  - 3. Collars.
  - 4. Steel sleeves.

# 2.3 FILL MATERIALS

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

additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

### 2.4 MIXING

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

## 3.2 PREPARATION

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

# 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

- 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
  - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning Penetration Firestopping Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

## 3.5 FIELD QUALITY CONTROL

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

# 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial

Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

# SECTION 07 84 43 - JOINT FIRESTOPPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
  - 2. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
  - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

## 1.6 CLOSEOUT SUBMITTALS

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

### 1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

### 1.9 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

## 2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Hilti, Inc.
    - c. Roxul Inc.
    - d. Specified Technologies, Inc.

- e. Thermafiber, Inc.; an Owens Corning company.
- f. Tremco, Inc.
- 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.

3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning Joint Firestopping Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

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

END OF SECTION 07 84 43
# SECTION 07 92 00 JOINT SEALANTS

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Nonstaining silicone joint sealants.
  - 2. Urethane joint sealants.
  - 3. Mildew-resistant joint sealants.
  - 4. Butyl joint sealants.
  - 5. Latex joint sealants.
- B. Related Requirements:
  - 1. Section 079219 Acoustical Joint Sealants for sealing joints in sound-rated construction.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
  - 1. Joint-sealant location and designation.
  - 2. Manufacturer and product name.
  - 3. Type of substrate material.
  - 4. Proposed test.
  - 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

- 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
- 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

# 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

# 1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
  - 3. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
  - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 5. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
  - 6. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
  - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  - 2. Conduct field tests for each kind of sealant and joint substrate.
  - 3. Notify University Representative seven days in advance of dates and times when test joints will be erected.
  - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

- a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
- 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
- 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

# 1.6 FIELD CONDITIONS

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

# 1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

# 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

# 2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.
    - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - d. Pecora Corporation.
    - e. Sika Corporation; Joint Sealants.
    - f. Tremco Incorporated.
    - g. Or equal.

## 2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation; Construction Systems.
    - b. Bostik, Inc.
    - c. Pecora Corporation.
    - d. Sherwin-Williams Company (The).
    - e. Sika Corporation; Joint Sealants.
    - f. Tremco Incorporated.
    - g. Or equal.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation; Construction Systems.
    - b. Pecora Corporation.
    - c. Sherwin-Williams Company (The).
    - d. Or equal.

## 2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.
    - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - d. Tremco Incorporated.
    - e. Or equal.

# 2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Bostik, Inc.
    - b. Pecora Corporation.
    - c. Or equal.

# 2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - b. Pecora Corporation.
    - c. Sherwin-Williams Company (The).
    - d. Tremco Incorporated.
    - e. Or. Equal.

# 2.7 FIRE-RATED CAULK SEALANT FOR WOOD DOORS

- A. Positive Pressure and Neutral Pressure Caulk Sealant for Wood Doors:
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Fire Solutions, Fire Door Caulk www.firedoorsolutions.com, 855.714.3473.
    - b. Or equal.

## 2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any type, as approved in writing by joint-sealant manufacturer for joint application indicated, and

of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.9 MISCELLANEOUS MATERIALS

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

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.

- b. Glass.
- c. Porcelain enamel.
- d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

## 3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured sealant joints as follows:

- a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
- b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
- 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
- 3. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
- 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
- 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

## 3.5 CLEANING

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

## 3.6 PROTECTION

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

## 3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
  - a. Joints in exterior stucco systems.
  - b. Joints between different materials listed above.
  - c. Perimeter joints between exterior materials frames of doors and windows.

- 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
  - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
  - a. Control and expansion joints on exposed interior surfaces of exterior walls.
  - b. Vertical joints on exposed surfaces of unit masonry walls.
  - 2. Joint Sealant: Urethane, S, NS, 25, NT.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
  - 1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 2. Joint Sealant: Acrylic latex.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints.
    - Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
- F. Joint-Sealant Application: Concealed mastics.
  - 1. Joint Locations:
    - a. Aluminum thresholds.
  - 2. Joint Sealant: Butyl-rubber based.
- G. Joint-Sealant Application: Interior joints in existing fire-rated wood doors.
  - 1. Joint Sealant: Fire-Rated Caulk Sealant.

END OF SECTION 07 92 00

2.

# SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
  - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Acoustical-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

## 1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

# 2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. GE Construction Sealants; Momentive Performance Materials Inc.
    - b. Hilti, Inc.
    - c. Pecora Corporation.
    - d. Tremco Incorporated.
    - e. United States Gypsum Company.
  - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pecora Corporation.
    - b. Serious Energy Inc.

#### 2.3 MISCELLANEOUS MATERIALS

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

## PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

#### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

## 3.4 CLEANING

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

# 3.5 PROTECTION

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

END OF SECTION 07 92 19

# SECTION 08 14 00 - WOOD DOORS

# PART 1 GENERAL

# 1.1 SECTION INCLUDES

- A. Rated and Non-Rated Flush Wood Doors.
- B. Rated and Non-Rated Sound Dampened Flush Wood Doors.
- C. Door Glazing.
- D. Door Louvers.

# 1.2 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes.
- C. Referenced Standards:
  - 1. ANSI/WDMA I.S.1-A Architectural Wood Flush Doors.

# 2. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- 3. ASTM E413 Standard Classification for Rating Sound Insulation.
- 4. ASTM F152 Standard Test Methods for Tension Testing of Nonmetallic Gasket Materials.
- 5. California Referenced Standard Code SFM Standard 12-7-4, Fire Door Assembly Tests.
- 6. ITS Directory of Listed Products.
- 7. NFPA 80 Fire Doors and Windows.
- 8. NFPA 252 Standard Test Methods for Fire Door Assemblies.
- 9. UL 10B Fire Tests of Door Assemblies.
- 10. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies.

11. WI/AWI Architectural Woodwork Standards, including WI Supplemental Text.

# 1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, fire ratings, swings, undercuts required, special beveling, special blocking for hardware and identify cutouts for glazing and louvers.

- C. Product Data: Indicate door core materials and construction; veneer species and cut, type and characteristics; factory machining criteria, factory finishing criteria.
- D. Samples: Submit three sets of three samples each of door veneer, 8 inches x 8 inches in size illustrating wood species, grain, and range of color.
- E. Manufacturer's certificate for sound dampened door assemblies:
  - 1. Shop Drawings: Submit shop drawings for the fabrication and erection of sound retardant doors and related frames. Include dimensions, details of construction, edge conditions, locations, and installation requirements of finish hardware, reinforcements and details of anchorage accessories.
  - 2. Test Reports: Submit test reports from a certified independent acoustical laboratory indicating the STC rating of each door, tested in accordance with ATSM E90 and classified in accordance with ASTM E413.
  - 3. Certifications: Submit certification that the door construction utilized has been tested in accordance with ASTM E90, and that the STC determined in accordance with ASTM E413 is not less than that required elsewhere in this Request for Proposal.

# 1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: All doors specified in this Section shall be manufactured and provided by a single manufacturer to ensure door compatibility and quality.
- B. Perform work in accordance with WI/AWI, Section 9, Custom Grade.
- C. Other requirements shall conform to WDMA I.S. 1A-04 as follows:

	Duty Level
Performance Attribute	Extra Heavy Duty
Adhesive Bond Durability WDMA TM-6, 1988	Туре І
Cycle Slam WDMA TM-7, 1990	1, 000,000 cycles
Hinge-Loading WDMA TM-8, 1990	550 pounds
Screwholding WDMA TM-10, 1990	
Door Face Unblocked	550 pounds
Door Face (with optional blocking)	700 pounds
Vertical Door Edge	550 pounds
Horizontal Door Edge (applies when hardware attached)	300 pounds
Telegraph WDMA T-1	Maximum 0.010 inch per 3-inch span
Warp Tolerance WDMA T-2	Maximum 0.25 inch per 3 foot 6 inches by 7 foot door section
Squareness WDMA T-3	Diagonal Variance 0.125 inch

D. Sound dampened doors shall bear manufacturer's label designating sound-rated construction and indicating the acoustical rating of the door assembly.

# 1.5 REGULATORY REQUIREMENTS

- A. Fire-Rated Wood Doors: Doors complying with 2019 California Building Code (CBC), Section 715 "Opening Protectives," Paragraph 715.4 "Fire Door and Shutter Assemblies," and NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, as applicable.
- B. Fire Door Construction: Conform to California State Fire Marshal Standard 12-7-4.
- C. Fire-Rated Doors: All fire rated doors shall have metal labels (including "S" labels) permanently fastened to the hinge stile indicating the fire rating and Testing Agency name. Do not apply primer or paint over fire rating labels.

# 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this Section.
- 1.7 DELIVERY, STORAGE AND HANDLING
  - A. Deliver, store, protect and handle products to site under provisions of Division 01.
  - B. Accept doors on site in manufacturer's packaging. Inspect for damage.
  - C. Comply with requirements in ANSI/WDMA I.S.1A: How to store, handle, finish, install and maintain wood doors.
  - D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to Owner.
  - E. Store flat on a level surface in a dry, well-ventilated building. Cover to keep clean but allow air circulation.
  - F. Handle with clean gloves and do not drag doors across one another or across other surfaces.
  - G. Do not subject door to abnormal heat, dryness or humidity.
  - H. Deliver in clean trucks and, in wet weather, under cover.

# 1.8 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.
- 1.9 COORDINATION
  - A. Coordinate the work with door opening construction, doorframe, door hardware, door glazing and door louver installation.

# 1.10 WARRANTY

A. Provide warranty under provisions of Division 01.

- B. Warranty Period:
  - 1. Interior Solid Core Standard Doors and Solid Core Sound Dampened Doors: Life of installation.
  - 2. Include coverage for delamination of veneer, warping or twisting (not to exceed 1/4 inch in any face including diagonal) or other defects. Warranty shall cover replacement of door plus costs of hanging and finishing.

# PART 2 PRODUCTS

- 2.1 MANUFACTURERS
  - A. Graham.
    - 1. GSD-SR Series Serenity Door Sound Solutions sound dampened rated and non-rated solid core and veneer edge doors with transparent finish and minimum STC rating of 40.
  - B. Eggers Industries.
  - C. Algoma Hardwoods, Inc.
  - D. VT Industries.
  - E. Substitutions: Under provisions of Division 01.

# 2.2 DOOR CONSTRUCTION

- A. All doors shall be 1-3/4 inch thickness, unless noted otherwise.
- B. Solid, non-rated particleboard core: WI/AWI Section 9, 5-ply; Custom Grade standards shall prevail.
- C. Solid, 20-minute rated particleboard core: WI/AWI Section 9, 5-ply, Custom Grade.
- D. Solid, 45-, 60- and 90-minute rated mineral core: WI/AWI Section 9. Stile edges shall be a minimum of 1 inch before trim on hinge side and 3/4 inch on lock side, including 1/4 inch outer edge band of hardwood.
- E. Sound dampening core, non-rated: Door manufacturer's standard; STC 40 minimum.
- F. Sound dampening core, rated: Door manufacturer's standard; 45 minute rated, STC 40 minimum.
- G. Faces:
  - 1. Veneer Species: Stain grade veneer for transparent finish.
  - 2. Match between Veneer Leaves: Book match.
  - 3. Assembly of Veneer Leaves on Door Faces: Balance match.
  - 4. Face veneers for pairs of doors shall be selected for color and grain match. Face veneers shall not be less than 1/50 inch at 12 percent moisture content after factory sanding. Crossbanding shall be high density fiberboard (HDF), MDF will not be allowed as a veneer substrate (crossband). Thin veneers are not acceptable.
  - 5. Use solid stock for exposed edges to match face veneer.

- H. Top and bottom rails shall be a minimum of 2-1/4 inch before trimming, mill option species structural composite lumber for 20 minute rated and non-rated doors.
- I. Provide solid firestop blocking on fire-rated doors with surface mounted hardware or closers, for attachment with screws in lieu of through-bolts.
- J. Fire Resistive Doors with 20 Minute Fire Rating (positive pressure): Construction shall have fire rating of not less than 20 minutes when tested in accordance with SFM Standard 12-7-4.
- K. Fire Resistive Doors with 45 Minute or Longer Fire Ratings (positive pressure): Meet requirements of SFM Standard 12-7-4, UL 10 (b)-80 and ASTM F152 for fire rating noted.

# 2.3 ADHESIVE

A. Facing Adhesive: Type I – waterproof.

# 2.4 ACCESSORIES

- A. Glazing Stops: LoPro by Anemostat or Slimline by Air Louvers, Inc. Factory primed, galvanized steel; mitered corners; prepared for countersink style screws. At fire-rated assemblies, fire-rating of glazing stops shall match fire-rating of opening. Install glazing stop fasteners on the non-secure side of doors.
- B. Sound Dampened Door Glazing Stops: LoPro-STC BB1 by Anemostat or accepted equal. Factory primed, 20 gauge cold rolled steel; beveled profile with mitered corners; prepared for countersink style screws. Install glazing stop fasteners on the non-secure side of doors.
- C. Glazing: As specified in Section 08 81 00.
- D. Door Louvers: Anemostat Model ADFL or Air Louver. Fabricate from cold rolled steel sheet. Permanent interlocking construction shall be used to secure blades to frame on fixed or stationary louvers. All frames shall have mitered and flush welded corners. Finish shall be factory primed to receive finish same as door. Louvers shall have 50 percent free air minimum.

# 2.5 FABRICATION

- A. Fabricate non-rated doors in accordance with WI/AWI Architectural Woodwork Standards requirements.
- B. Provide blocking at top of door for closer for attachment with screws.
- C. Bond edge banding to cores.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Glass Cutouts: Provide cutouts for glass of size and shape indicated. Glass for doors is specified under Sections 08 81 00 and 08 88 13.
- F. Louver Cutouts: Provide cutouts for louvers of size and shape indicated.
- G. Factory seal top and bottom rails before shipment.

H. Bevel both stiles 1/8 inch in 2 inches (3 degree bevel) and undersize doors 1/4 inch in width so that they swing freely and do not hinge bind.

# 2.6 SOUND DAMPENED WOOD DOOR/FRAME FABRICATION

- A. Provide sound dampened doors from manufacturers that have the ability to meet sound transmission class (STC) ratings specified in this Section with non-rated or 45 minute rated door/frame applications.
- B. Provide door manufacturer's recommended hinges, head and jamb seals, astragals, door bottoms and miscellaneous fasteners and accessories to achieve the STC ratings specified in this Section. Balance of hardware scheduled in Section 08 71 00 shall be coordinated with sound dampened doors and frames.
- C. Provide door manufacturer's recommended undercut for gasketing system required to achieve the STC ratings specified in this Section.
- D. Door glazing stops and glazing shall be factory installed to achieve the STC ratings specified in this Section. Refer to Sections 08 81 00 and 08 88 13 for glazing.
- E. Door frames at sound dampened assemblies shall have the inside coated with asphaltic emulsion and be filled solid with grout. Refer to Section 08 11 13.
- F. Fabricate and fit sound dampened doors accurately in their respective frames to accommodate the required acoustical seals and threshold. Coordinate with Section 08 11 13.

# 2.7 FINISH

- A. All doors shall be site finished under provisions of Section 09 91 00.
- B. All doors shall be factory pre-finished, equal to WI/AWI Section 5, System #3, or accepted equal. Transparent finish. Apply finish at all edges of doors.

# PART 3 EXECUTION

# 3.1 EXAMINATION

- A. Verify frame opening conditions.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

# 3.2 INSTALLATION

- A. Install rated and non-rated doors in accordance with WI/AWI Section 9 requirements, SFM Standard 12-7-4, and UL or Intertek Testing Services (ITS) requirements.
- B. Pre-adjust door height, supply doors with factory undercut.
- C. Where required, trim non-rated door width by cutting equally on both jamb edges.

- D. Where required, trim door height by cutting bottom edge to a maximum of 3/8 inch above finished floor or threshold.
- E. Pilot drill screw and bolt holes.
- F. Machine cut for hardware. Core for handsets and cylinders.
- G. Coordinate installation of doors with installation of frames specified in Section 08 11 13, hardware specified in Section 08 71 00, and glazing as specified in Sections 08 81 00 and 08 88 13, and louvers as specified in this Section.
- H. Sound Dampened Doors: Auto door bottom devices shall not be adjusted until just prior to project final completion. Door bottoms shall be raised to highest position while construction occurs so rubber seal will not be torn or damaged by debris under the door. Just prior to project final completion, adjust door bottom to fully engage and touch finished floor for proper sound dampening. Adhesive Corner Pad shall be free of dirt and debris, and shall be installed just prior to project final completion.

# 3.3 INSTALLATION TOLERANCES

- A. Maximum Diagonal Distortion (Warp): 1/4 inch measured with straight edge or taught string, corner to corner, over an imaginary 36 inch x 84 inch surface area.
- B. Maximum Vertical Distortion (Bow): 1/4 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 inch x 84 inch surface area.

## 3.4 ADJUSTING

- A. Adjust work under provisions of Division 01.
- B. Adjust door for smooth and balanced door movement and wipe clean.

# END OF SECTION

# SECTION 08 71 00 – DOOR HARDWARE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Mechanical and electrified door hardware for:
    - a. Swinging doors.
    - b. Gates.
- 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
  - 6. Installation.
  - 7. Rough hardware.
  - 8. Conduit, junction boxes & wiring.
  - 9. Sliding aluminum doors, except cylinders where detailed.
  - 10. Access doors and panels, except cylinders where detailed.
- 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.
  - 3. Division 08 metal doors and frames, interior aluminum frames, wood doors, storefront and glazed curtainwall systems.
  - 4. Division 26 sections for connections to electrical power system and for low-voltage wiring.
  - 5. Division 28 sections for coordination with other components of electronic access control system.

## **1.3 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. ANSI American National Standards Institute

- 1. ANSI/BHMA A156.1 A156.29, and ANSI/BHMA A156.31 Standards for Hardware and Specialties
- C. NFPA National Fire Protection Association
  - 1. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
  - 2. NFPA 105 Smoke and Draft Control Door Assemblies
  - 3. NFPA 252 Fire Tests of Door Assemblies
- D. UL Underwriters Laboratories
  - 1. UL10C Positive Pressure Fire Tests of Door Assemblies.
  - 2. UL 305 Panic Hardware
- E. BHMA Builders Hardware Manufacturers Association
- F. California Code of Regulations
  - 1. Title 24: California Building Standards Code
  - 2. 2019 California Building Code
    - a. Chapter 11B Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing

# 1.4 SUBMITTALS

- A. General:
  - 1. Submit in accordance with Conditions of Contract and Division 01 requirements.
  - 2.
- 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. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
    - a. Wiring Diagrams: For power, signal, and control wiring and including:
      - 1) Details of interface of electrified door hardware and building safety and security systems.
      - 2) Schematic diagram of systems that interface with electrified door hardware.
      - 3) Point-to-point wiring.
      - 4) Risers.
  - 3. 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.
  - 4. 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.
  - 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.
- 5. Key Schedule:
  - a. Initiate and conduct meeting(s) with Owner representatives and hardware supplier to determine system keyway(s), keybow styles, structure, stamping, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner.
  - b. 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.
  - c. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - d. 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.
  - e. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - f. 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 Owner, by means as directed by Owner.
- 6. 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 and Installer.
  - 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. 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. 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. Final approved hardware schedule, edited to reflect conditions as-installed.
    - e. Final keying schedule
    - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - g. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

# 1.5 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.
  - 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
  - 2. 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.
  - 3. 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. 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.
- E. 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.
- F. 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.
- G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- H. Means of Egress Doors: Latches do not require more than 5 lbs (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- I. 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 lbs (22.2 N).
  - 2. Maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbs (22.2 N) applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbs (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.
- J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Inspect and discuss preparatory work performed by other trades.
  - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
  - 4. Review sequence of operation for each type of electrified door hardware.
  - 5. Review required testing, inspecting, and certifying procedures.
- K. Coordination Conferences:
  - 1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
    - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

- 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
  - a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Owner's security consultant, Architect and Contractor.
  - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

# 1.6 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 and permanent cores to Owner by registered mail or overnight package service.

# 1.7 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 Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings:
  - 1. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing

conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.

- 2. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.
- F. Direct shipments not permitted, unless approved by Contractor.

# 1.8 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.
      - 2) Electrified: 2 years.
    - b. Automatic Operators: 2 year
    - c. Exit Devices:
      - 1) Mechanical: 3 years.
      - 2) Electrified: 1 year.
    - d. Locksets:
      - 1) Mechanical: 10 years.
      - 2) Electrified: 1 year.
    - e. Continuous Hinges: Lifetime warranty
    - f. Key Blanks: Lifetime
  - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

## 1.9 MAINTENANCE

- A. Maintenance Tools:
  - 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

## 1.10 REGULATORY REQUIREMENTS:

- A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2019 California Building Code, Section 11B-404.2.7.
  - 1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.
- B. Handles, pull, latches, locks, other operable parts:
  - 1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2019 California Building Code Section 11B-309.4.
  - 2. Force required to activate the operable parts: 5.0 pounds maximum, per 2019 California Building Code Section 11B-309.4.

- C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2019 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
  - 1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
- D. Low-energy powered doors: comply with ANSI/BHMA A156.19. Reference: 2019 California Building Code Section 11B-404.2.9, Exception 2.
  - 1. Where powered door serves an occupancy of 150 or more, provide back-up battery power or stand-by generator power, capable of supporting a minimum of 100 cycles.
  - 2. Actuators, vertical bar type: minimum 2-inches wide, 30-inches high, bottom located minimum 5-inches above floor or ground, top located minimum 35-inches above floor or ground. Displays International Symbol of Accessibility, per 2019 California Building Code Section 11B-703.7.
  - 3. Actuators, plate type: use two at each side of the opening. Minimum 4-inches diameter or 4-inches square. Displays International Symbol of Accessibility, per 2019 California Building Code Section 11B-703.7. Locate centerline of lower plate between 7- and 8-inches above floor or ground, and upper plate between 30- and 44-inches above floor or ground.
  - 4. Actuator location: conspicuously located, clear and level floor/ground space for forward or parallel approach.
- E. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2019 California Building Code Section 11B-404.2.8.
  - 1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.
- F. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2019 California Building Code Section 11B-404.2.10.
  - 1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.
  - 2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.
- G. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2019 California Building Code Section 11B-404.2.3.
  - 1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
  - 2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2019 California Building Code 11B-307.4.
- H. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2019 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope). 2019 California Building Code Section 11B-303.2 & ~.3.

- I. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).
- J. Pairs of doors with independently-activated hardware both leafs: limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2019 California Building Code Section 11B-703.4.2.
- K. Door and door hardware encroachment: when door is swung fully-open into means-ofegress path, the doo may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 44-inches above the floor/ground. 2019 California Building Code, Section 1005.7.1.
- L. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2019 California Building Code, Section 1005.7.1 at Exception 1.

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. 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 Manufacturer" 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. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Ives 5BB series
  - 2. Acceptable Manufacturers and Products: Hager BB series, McKinney TA/T4A series, Stanley FBB Series
- B. Requirements:
  - 1. Provide five-knuckle ball bearing hinges conforming to ANSI/BHMA A156.1.
  - 2. 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
  - 3. 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
  - 4. 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
  - 5. 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.
  - 6. 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.
  - 7. 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
  - 8. 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.
  - 9. 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.
  - 10. 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.
  - 11. Provide mortar guard for each electrified hinge specified.
  - 12. 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 CONTINUOUS HINGES

- A. Aluminum Geared
  - 1. Manufacturers:
    - a. Scheduled Manufacturer: lves.
    - b. Acceptable Manufacturers: Markar, Stanley.
  - 2. Requirements:
    - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
    - c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    - d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
    - e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
    - f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
    - g. Install hinges with fasteners supplied by manufacturer.
    - h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

# 2.5 ELECTRIC POWER TRANSFER

- A. Manufacturers:
  - a. Scheduled Manufacturer: Von Duprin EPT-10
  - b. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.6 FLUSH BOLTS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Requirements:
  - 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 dustproof strikes at each bottom flush bolt.

# 2.7 COORDINATORS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Requirements:
  - 1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
  - 2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

# 2.8 MORTISE LOCKS

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Schlage L9000 series
  - 2. Acceptable Manufacturers and Products: No substitute.
- B. Requirements:
  - 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. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
    - a. Universal input voltage single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
    - b. Fail Safe/Fail Secure changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
    - c. Low maximum current draw maximum 0.4 amps to allow for multiple locks on a single power supply.
    - d. Low holding current maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
    - e. Request to Exit Switch (RX) -
      - 1) Modular Design provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
      - 2) Monitoring where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
    - f. UL Listed 3 hour fire door
  - 6. 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: As scheduled.
- C. Padlocks:
  - 1. Manufacturers and Products:
    - a. Scheduled Manufacturer and Product: American 5200 series
  - 2. Requirements:
    - a. Provide padlocks with 1 inch (25 mm) shackle height, unless noted otherwise, as specified. Cylinders: Refer to "KEYING" article, herein.

# 2.9 EXIT DEVICES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Von Duprin 98 series
  - 2. Acceptable Manufacturers and Products: No substitute
- B. Requirements:
  - 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
  - 2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
  - 3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. No plastic inserts are allowed in touchpads.
  - 4. Provide exit devices with dead-latching feature for security and for future addition of alarm kits and/or other electrified requirements.
  - 5. Provide flush end caps for exit devices.
  - 6. Provide exit devices with manufacturer's approved strikes.
  - 7. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
  - 8. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
  - 9. Provide cylinder dogging at non-fire-rated exit devices.
  - 10. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
  - 11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
    - a. Lever Style: Match lever style of locksets.
  - 12. Accessibility: Maximum 5lbs force to retract latch bolt per CBC Chapter 11B.
    - "AX" feature: touchpad directly retracts the latchbolt with 5 lb or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.
  - 13. Provide UL labeled fire exit hardware for fire rated openings.
  - 14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
  - 15. Provide electrified options as scheduled.

- 2.10 POWER SUPPLIES
  - A. Manufacturers and Products:
    - 1. Scheduled Manufacturer and Product: Schlage or Von Duprin PS900 series
    - 2. Acceptable Manufacturers and Products: Securitron BPS series, Security Door Controls 600 series
  - B. Requirements:
    - 1. Provide power supplies, recommended and approved by manufacturer of electrified locking component, for operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring power supply.
    - Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
    - 3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
    - 4. Options:
      - a. Provide power supply, where specified, with internal capability of charging sealed backup batteries 24 VDC, in addition to operating DC load.
      - b. Provide sealed batteries for battery back-up at each power supply where specified.
      - c. Provide keyed power supply cabinet.
    - 5. Provide power supply in an enclosure, complete, and requiring 120VAC to fused input.
    - 6. Provide power supply with emergency release terminals, where specified, that allow release of all devices upon activation of fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

# 2.11 CYLINDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Russwin
  - 2. Acceptable Manufacturers: No substitute.
- B. Requirements:
  - Provide cylinders to match Owner's existing key system, 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. Exterior: Provide N15 keyway
    - b. Interior: Provide N21 keyway
    - c. Card reader locations: Provide N15 keyway.
  - 3. Temporary Construction Cylinder Keying.
    - a. Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
      - 1) Split Key or Lost Ball Construction Keying System.
      - 2) 3 construction control keys, and extractor tools or keys as required to void construction keying.
      - 3) 12 construction change (day) keys.

b. Owner or Owner's Representative will void operation of temporary construction keys.

## 2.12 KEYING

- A. Provide cylinders/cores keyed into Owner's existing factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:
  - 1. Provide permanent cylinders keyed by the manufacturer according to the following key system.
    - a. Master Keying system as directed by the Owner.
  - 2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - 3. Provide keys with the following features:
    - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
  - 4. 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 Owner.
    - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE".
    - d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
    - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
  - 5. Quantity: Furnish in the following quantities.
    - a. Change (Day) Keys: 3 per cylinder.
    - b. Master Keys: 6.

## 2.13 DOOR CLOSERS

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: LCN 4040XP series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - 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.

# 2.14 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: LCN 4600 series
  - 2. Acceptable Manufacturers and Products: No substitute.
- B. Requirements:
  - 1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
  - 2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
  - 3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
  - 4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
  - 5. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
  - 6. Provide drop plates, brackets, or adapters for arms as required for details.
  - 7. Provide hard-wired actuator switches for operation as specified.
  - 8. Provide weather-resistant actuators at exterior applications.
  - 9. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
  - 10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
  - 11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

## 2.15 DOOR TRIM

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Rockwood, Trimco

## B. Requirements:

- 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.

# 2.16 PROTECTION PLATES

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Requirements:
  - 1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges 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

# 2.17 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.

### 2.18 DOOR STOPS AND HOLDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 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.

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

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Zero International
  - 2. Acceptable Manufacturers: National Guard, Pemko
- B. Requirements:
  - 1. Provide thresholds, weather-stripping (including door sweeps, seals, and 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.

### 2.20 SILENCERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Requirements:
  - 1. Provide "push-in" type silencers for hollow metal or wood frames.
  - 2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
  - 3. Omit where gasketing is specified.

### 2.21 MAGNETIC HOLDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: LCN

- 2. Acceptable Manufacturers: Rixson, Sargent
- B. Requirements:
  - Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

### 2.22 MAGNETIC CATCHES

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves
  - 2. Acceptable Manufacturers: Engineered Products Company, Rockwood
- B. Requirements:
  - 1. Provide magnetic catches with self-aligning magnets that can be surface mounted or mortised.
  - 2. Provide magnetic catches in an aluminum case 1 inch wide x 3-1/8 inch long. Provide dual triple pole (Ives 327), where scheduled, with 14 pound load capacity, and dual double pole catches (Ives 326), where scheduled, with 9 pound load capacity.

### 2.23 DOOR POSITION SWITCHES

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Schlage
  - 2. Acceptable Manufacturers: GE-Interlogix, Sargent
- B. Requirements:
  - 1. Provide recessed or surface mounted type door position switches as specified.
  - 2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

## 2.24 COAT HOOKS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves.
  - 2. Acceptable Manufacturers: Rockwood, Trimco
- B. Provide coat hooks as specified.

### 2.25 FINISHES

- A. Finish: BHMA 626/652 (US26D); except:
  - 1. Hinges at Exterior Doors: BHMA 630 (US32D)
  - 2. Continuous Hinges: BHMA 630 (US32D)
  - 3. Continuous Hinges: BHMA 628 (US28)
  - 4. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
  - 5. Protection Plates: BHMA 630 (US32D)
  - 6. Overhead Stops and Holders: BHMA 630 (US32D)
  - 7. Door Closers: Powder Coat to Match

- 8. Wall Stops: BHMA 630 (US32D)
- 9. Latch Protectors: BHMA 630 (US32D)
- 10. Weatherstripping: Clear Anodized Aluminum
- 11. 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
  - 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
  - 2. Field modify and prepare existing door and frame for new hardware being installed.
  - 3. When modifications are exposed to view, use concealed fasteners, when possible.
  - 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 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 are provided.
- H. Lock Cylinders: Install construction cylinders to secure building and areas during construction period.
- I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
  - 1. Conduit, junction boxes and wire pulls.
  - 2. Connections to and from power supplies to electrified hardware.
  - 3. Connections to fire/smoke alarm system and smoke evacuation system.
  - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  - 5. Testing and labeling wires with Architect's opening number.
- J. 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.
- K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
  - 1. Coordination: Coordinate provision with the security systems provider to mitigate excessive or redundant purchase.
  - 2. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- N. 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.
- O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

#### 3.4 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. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. 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 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.

### 3.5 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.

### 3.6 DEMONSTRATION

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

### 3.7 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. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.
- C. Hardware Sets:

### <u>HW SET: 01</u>

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050L 03A L583-363 L283-711	626	SCH
1	EA	MORTISE CYLINDER	1000-118-A06 x N15 or N21 KEYWAY	626	RUS
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
2	EA	DOOR SEAL	188SBK PSA (HEAD & JAMBS)	BK	ZER

## <u>HW SET: 02</u>

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	PA-AX-98-L-2SI-03-299	626	VON
1	EA	RIM CYLINDER	3000-200 x N21 (verify)		RUS
1	EA	RIM CYL THUMBTURN	XB11-979	643e	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
1	EA	DOOR SEAL	188SBK PSA (HEAD & JAMBS)	BK	ZER

<u>HW SET: 03</u>

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
REPLA	CE DOC	OR CLOSER. ALL OTHER EXIS	TING HARDWARE TO REMAIN, POWER	R ASSIST	ANCE ADDED
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN

## HW SET: 04

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	PA-AX-98-L-F-2SI-03-299F	626	VON
1	EA	RIM CYLINDER	3000-200 x N21 (verify)		RUS
1	EA	RIM CYL THUMBTURN	XB11-979	643e	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
1	EA	DOOR SEAL	188SBK PSA (HEAD & JAMBS)	BK	ZER

## HW SET: 05

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
3 1 1	EA EA EA	HINGE STOREROOM LOCK MORTISE CYLINDER	5BB1 4.5 X 4.5 L9080L 03A 1000-118-A06 x N15 or N21	652 630 626	IVE SCH RUS
1	EA	OH STOP & HOLDER	KEYWAY 90H	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

## HW SET: 06

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070L 03A	626	SCH
1	EA	MORTISE CYLINDER	1000-118-A06 x N15 or N21 KEYWAY	626	RUS
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
1	EA	DOOR SEAL	188SBK PSA (HEAD & JAMBS)	BK	ZER

## HW SET: G01

<u>QTY</u>		DESCRIPTION	CATALOG NUMBER	<u>FINISH</u>	<u>MFR</u>
		SELF-CLOSING GATE HINGES	PROVIDED BY GATE FABRICATOR		B/O
1	EA	CANE BOLT - LOCKABLE	SPEC. NO. 48		RIC
1	EA	PADLOCK	AMERICAN 5200 (6-PIN-KNZ- PINNED TO BLANKS)	606	AML
1	EA	PANIC HARDWARE	PA-AX-98-NL-OP-110MD X STRIKE AS REQ'D	626	VON
1	EA	RIM CYLINDER	3000-200 x N15 (verify)		RUS
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE

BALANCE OF HARDWARE PROVIDED BY GATE FABRICATOR. PROVIDE MOUNTING PLATES AS REQUIRED.

## SECTION 08 71 13 - AUTOMATIC DOOR OPERATORS

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Description of requirements for materials, fabrications and installation of automatic door operator systems as necessary to complete the Work. The system shall consist of:
  - 1. Electric overhead operator and actuating controls to be installed at designated doors.

### 1.2 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes.
- C. Conform to the following Referenced Standards and Regulatory Requirements:
  - 1. AAADM American Association of Automatic Door Manufacturers
  - 2. ADAAG ADA Accessibility Guidelines for Buildings and Facilities (28 CFR, Part 36, Appendix A).
  - 3. ANSI A156 Series Builders Hardware Manufacturers Association (BHMA) Standards Set.
  - ANSI A117.1 Guidelines for Accessible and Usable Buildings and Facilities. Conform to applicable requirements of the Americans with Disabilities Act Accessibility Guidelines regarding accessibility requirements for door and entrance hardware.
  - 5. BHMA156.10 Full Power-Operated Doors.
  - 6. BHMA A156.19 Power-Assisted and Low Energy Doors.
  - 7. CBC 2019 California Building Code Sections 1003.3.1.8, 11B-404.2.7, and 11B-404.2.9, and 1008.1.8. Section CBC 11B-404.2.5 for thresholds.
  - 8. Conform to applicable requirements of Title 24, Part 2, CCR 2010 regarding exiting and accessibility requirements for door and entrance hardware.
  - 9. All hardware shall meet the requirements of CBC Sections 1010.1.9.1, 1010.1.3, and 1008.1.8.
  - 10. Hand-activated door opening hardware, handles, pulls, latches, locks, and other operating devices on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or 1126a.5 twisting of the wrist to operate. Hardware shall be centered between 34" and 44" above the floor per CBC Section 11B-404.2.7.
- 1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation shall be by manufacturer's authorized representative employing skilled mechanics thoroughly trained and experienced in this type of installation and who are completely familiar with the requirements of the work specified herein.
- B. All equipment shall comply with ANSI A156.19, latest Edition.

### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Complete shop drawings and/or manufacturer's detail catalog layout sheets, including all necessary wiring diagrams and all data necessary for the proper preparation of interface connections by other trades.
  - 1. Provide a label on the equipment listing the company name and phone number for service.
- C. Maintenance Data: Submit two copies of operator maintenance manuals that include the following items:
  - 1. Lubrication instructions.
  - 2. Operator maintenance instructions.
  - 3. Capability of servicing by local firm(s). (List name, address and phone number of firm(s)).

### 1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials under protective cover and store within dry enclosed spaces. Protect from damage prior to and during installation.

### PART 2 PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. LCN Auto Equalizer 4600 Series
  - B. Nabco GT85
  - C. Substitutions: Under provisions of Division 01.
- 2.2 GENERAL
  - A. The operator system shall consist of a 120 VAC surface mounted electric operators with connecting arm and aluminum cover as well as wall-mounted push plate switches.
  - B. The System shall be completely engineered, manufactured and assembled in the factory. All operator components shall be factory assembled, adjusted and tested. No field wiring or operator adjustment shall be required other than the connection to job-site power.

## 2.3 MATERIALS AND FABRICATION

- A. Electric Operator: LCN 4630/4640 or approved equal:
  - 1. Comply with ANSI/BHMA 156.19 and 2019 California Building Code Section 11B-404.2.9, Exception 2: Electric power-open and close operation. Modular construction.

Finished metal cover. Field-adjustable opening force, opening speed, time-open, closing and latching speeds. Door reopens and timing cycle restores if system reactuated during closing cycle. Breakaway clutch protection from forced closing. Door, frame, motor and drive train protected by attenuated initiation of opening cycle.

- 2. The control shall be furnished with a selection switch that provides for two methods of actuating the automatic door. The selection switch shall enable the Owner to select the desired operation and adapt to changing conditions.
- B. Switch:
  - 1. Switch shall be LCN 8310-836TW wireless, 6 inch wide stainless steel switch push plate engraved with the international accessibility insignia and marked "Press to Open".

## PART 3 EXECUTION

## 3.1 INSPECTION

- A. The operator installer shall examine the areas and conditions under which the automatic operators are to be installed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Measurements: Verify all dimensions by taking field measurements before any material is fabricated and shipped to the job site.

### 3.2 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations. Set units plumb, level and true to line without warp or rack of frames or doors.
- B. Sealants: Furnish and install all sealants indicated or required to complete installation per Section 07 92 00. Sealant shall be polysulfide base or silicone base applied with primer, back-up, bond breaker and solvent as recommended by the manufacturer.
- C. Coordinate operator installation with electrical connection requirements.

## 3.3 ADJUST AND CLEAN

- A. After repeated operation of completed installation, readjust door operators and controls for smooth, quiet and optimum operating condition and safety. Clean surfaces promptly after installation. Provide protective treatment and other precautions required through the remainder of the construction period to ensure that automatic operators will be without damage or deterioration.
- B. Defective Work: Remove and replace any defective work that cannot be properly repaired, cleaned or touched up.

END OF SECTION 08 71 13

## SECTION 09 29 00 - GYPSUM BOARD

- PART 1 GENERAL
- 1.1 SECTION INCLUDES
  - A. Gypsum board:
    - 1. Type X gypsum board.
    - 2. Moisture resistant gypsum board.
    - 3. Hi-impact gypsum wall systems.
  - B. Gypsum sheathing.
  - C. Cementitious backer board.
  - D. Accessories.

## 1.2 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes.

## C. Referenced Standards:

1.	ANSI A108.11	<ul> <li>Interior Installation of Cementitious Backer Units.</li> </ul>
2.	ANSI A118.1	<ul> <li>Dry-Set Portland Cement Mortar.</li> </ul>
3.	ANSI A118.4	<ul> <li>Latex-Portland Cement Mortar.</li> </ul>
4.	ANSI A118.9	<ul> <li>Test Methods and Specifications for Cementitious Backer Units.</li> </ul>
5.	ASTM B117	<ul> <li>Standard Practice for Operating Salt Spray (Fog) Apparatus.</li> </ul>
6.	ASTM C473	<ul> <li>Standard Test Method for Physical Testing of Gypsum Panel Products.</li> </ul>
7.	ASTM C475/C475M	<ul> <li>Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.</li> </ul>
8.	ASTM C840	<ul> <li>Standard Specification for Application and Finishing of Gypsum Board.</li> </ul>
9.	ASTM C954	<ul> <li>Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.</li> </ul>

10. ASTM C1002	<ul> <li>Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.</li> </ul>
11. ASTM C1047	<ul> <li>Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.</li> </ul>
12. ASTM C1177/C1177M	<ul> <li>Standard Specification for Glass Mat Gypsum Sub- strate for Use as Sheathing.</li> </ul>
13. ASTM C1278/C1278M	<ul> <li>Standard Specification for Fiber-Reinforced Gypsum Panel.</li> </ul>
14. ASTM C1325	<ul> <li>Standard Specification for Non-Asbestos Fiber-Mat Re- inforced Cement Interior Substrate Sheets.</li> </ul>
15. ASTM C1396/C1396M	<ul> <li>Standard Specification for Gypsum Board.</li> </ul>
16. ASTM D226	<ul> <li>Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.</li> </ul>
17. ASTM D1117	<ul> <li>Standard Guide for Evaluating Nonwoven Fabrics.</li> </ul>
18. ASTM D2103	<ul> <li>Standard Specification for Polyethylene Film and Sheeting.</li> </ul>
19. ASTM D3273	<ul> <li>Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Envi- ronmental Chamber.</li> </ul>
20. ASTM E96	<ul> <li>Standard Test Methods for Water Vapor Transmission of Materials.</li> </ul>
21. ASTM E695	<ul> <li>Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.</li> </ul>
22. GA-214	<ul> <li>Recommended Levels of Gypsum Board Finish.</li> </ul>
23. GA-216	<ul> <li>Application and Finishing of Gypsum Board.</li> </ul>
24. GA-253	<ul> <li>Application of Gypsum Sheathing.</li> </ul>
25. GA-600	<ul> <li>Fire Resistance Design Manual.</li> </ul>

26. UL Fire Resistance Directory.

# 1.3 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Product Data: Submit manufacturer's descriptive literature and product specification for each product.
- C. Samples: Submit two 2 foot by 2 foot samples of spray-applied texture finish.

# 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum 5 years experience.

- 2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least 5 projects of similar nature in past 3 years.
- B. Regulatory Requirements: Comply with requirements of CBC Chapter 25.
- C. Coordinate work in this Section with work in related Sections.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Storage and Protection: Store materials in a dry secure place; neatly stacked to prevent sagging or damage to edges, ends, and surfaces. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Interior Environmental Requirements:
  - Maintain room temperature at not less than 40 degrees F during application of gypsum board, except when adhesive is used for the attachment of gypsum board. Maintain room temperature at not less than 50 degrees F for bonding of adhesive, joint treatment, texturing, and decoration for 48 hours prior to and continuously thereafter until completely dry.
  - 2. Provide adequate ventilation during installation and curing period.
  - 3. Prevent exposure to excessive or continuous moisture before, during, and continuously after installation. Eliminate sources of moisture immediately.
  - 4. Protect gypsum board from direct exposure to rain, snow, sunlight, or excessive weather conditions.

## PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Acceptable Manufacturers:

- 1. USG United States Gypsum Company, Chicago, IL 60606; toll free: 800.874.4968; phone: 312.606.4000; fax: 312.606.5566; URL: http://www.usg.com .
- 2. National Gypsum Co., Charlotte, NC 28211; phone: 704.365.7300; fax: 800.329.6421; URL: http://www.nationalgypsum.com .
- 3. GP-Gypsum Georgia-Pacific Corp., Atlanta, GA 30303; toll free: 800.824.7503; phone: 404.652.4000; fax: 404.230.5624; URL: http://www.gp.com .
- 4. Pabco Gypsum, Newark, CA 94560; phone: 510.792.9555; fax: 510.794.8725; URL: http://pabcogypsum.paccoast.com .
- 5. Certainteed Corporation, Valley Forge, PA; toll free: 800-233-8990; URL: www.certainteed.com.

B. Substitutions: Under provisions of Division 01.

## 2.2 GYPSUM BOARD

- A. Type X: ASTM C1396/1396M; 5/8-inch thick; fire resistant core; maximum permissible length; ends square cut, tapered edges.
  - 1. Acceptable Products:
    - a. Sheetrock Brand Firecode Core manufactured by USG,
    - b. Gold Bond Brand Fire-Shield manufactured by National Gypsum,
    - c. ToughRock Fireguard manufactured by G-P Gypsum,
    - d. or accepted equal.
- B. Moisture Resistant Gypsum Board: ASTM C1396/C1396M; 5/8 inch thick Type X, moisture and mold resistant core, encased in moisture resistant paper facers; maximum permissible length; ends square cut, tapered edges.
  - 1. Average water absorption after 2-hour immersion per ASTM C473: 5 percent or less.
  - 2. Mold and mildew resistance per ASTM D3273: Minimum average score 8.
  - 3. Acceptable Products:
    - a. Sheetrock Brand Mold Tough Gypsum Panels manufactured by USG,
    - b. DensArmour Plus Interior Guard manufactured by G-P Gypsum,
    - c. Gold Bond Brand XP Wallboard manufactured by National Gypsum,
    - d. or accepted equal.
- C. Hi-Impact Gypsum Wall System: 1000 cycles abrasion resistance per modified test ASTM D4977; minimum 115 foot-pounds hard-body penetration resistance per USG impact test method; minimum 300 foot-pounds soft-body penetration resistance per ASTM E695.
  - 1. Acceptable Systems:
    - a. US Gypsum Co.: 5/8 inch thick Fiberock VHI (Very-High-Impact) fire rated gypsum board panel with 2 coats Imperial Veneer,
    - b. National Gypsum Co.: 5/8 inch thick Fire-Shield Type X, Hi-Impact Brand XP Wallboard panel with 2 coats Kal-Kote veneer plaster,
    - c. or accepted equal.
  - 2. Accessories:
    - a. Sound damping gypsum board manufacturer's acoustical sealant and acoustical putty.
    - b. ASTM C1002 Type S or S12 fine thread drywall screws.
- 2.3 ACCESSORIES

- A. Corner Bead, Edge Trim, Decorative Dividers: ASTM C1047; zinc-coated sheet steel.
- B. Control Joints: ASTM C1047; roll-formed zinc joint with removable protected opening; provided in accordance with UL fire rated assemblies. Acceptable product: Zinc Control Joint No. 093 manufactured by USG, or accepted equal.
- C. Screws:
  - 1. ASTM C1002, Type S or Type A; bugle head; self drilling and self tapping screws for light gauge steel framing (less than 0.033 inch thick).
  - 2. ASTM C954; bugle head; self-drilling and self tapping screws for heavy gauge steel framing (0.033 inch to 0.112 inch thick).
  - 3. ASTM C1002 Type W or Type A; bugle head; provide sufficient length to provide a minimum 3/4 inch penetration into wood framing members.
- D. Jointing Tape: ASTM C475/C475M; 2 inch wide heavy duty paper joint tape.
- E. Joint Compound: ASTM C475/C475M.
- F. Primer-Surfacer (used in lieu of skim coat in a Level 5 finish): High-build interior coating finish applied with an airless sprayer. Products: Sheetrock Brand Primer-Surfacer Tuff-Hide manufactured by USG, ProForm Brand Surfacer/Primer manufactured by National Gypsum, or accepted equal. Note: walls applied with primer-surfacer do not require drywall paint primer prior to application of finish coats.
- G. Acoustical Sealant: Refer to Section 07 92 00.
- H. Firestop Putty Pads for Electrical Boxes: Intumescent moldable firestop putty pad. Acceptable products: SSP4S 7.25 inches by 7.25 inches or SSP9S 9 inches by 9 inches manufactured by Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, www.stifirestop.com, or accepted equal.

## 2.4 GYPSUM SHEATHING

- A. ASTM C1177/C1177M, glass mat-faced; or ASTM C1278/C1278M, fiber reinforced; water-resistant treated gypsum core; 5/8-inch thick Type X.
  - 1. Acceptable products:
    - a. DensGlass Gold Fireguard manufactured by GP-Gypsum,
    - b. Securock Sheathing manufactured by USG,
    - c. e²XP™ Extended Exposure Sheathing manufactured by National Gypsum Co.,
    - d. GlasRoc Sheathing manufactured by BPB,
    - e. or accepted equal.
- B. Building Wrap and Flexible Flashings: Refer to Section 07 25 00.
- 2.5 CEMENTITIOUS BACKER BOARD

- A. Cement Board: ANSI A118.9 and ASTM C1325; polymer-modified cementitious board, with alkali-resistant fiberglass mesh reinforcing facers (front and back); long edges wrapped.
  - 1. Thickness: 1/2 inch [5/8 inch].
  - 2. Acceptable products:
    - a. Durock Brand Cement Board by United States Gypsum Co.,
    - b. PermaBase Cement Board by National Gypsum Co.,
    - c. or accepted equal.
- B. Accessories:
  - 1. Screws: No. 6 gauge by sufficient length to penetrate 3/4 inch into wood framing and 3/8 inch into steel framing, self-drilling, ribbed wafer head or bugle head screws; minimum 500 hour corrosion resistant finish per ASTM B117.
  - 2. Jointing Tape: Alkali-resistant fiberglass mesh tape; 2 inch wide (interior applications); 4 inch wide (exterior applications).
  - 3. Bonding and Jointing Materials: ANSI A118.1, dry-set Portland cement mortar; or ANSI A118.4, latex-portland cement mortar.
  - 4. Moisture Retarding Membrane: 4 mil polyethylene sheet, ASTM D2103, Type 13300; or 15 pound roofing felt, ASTM D226, Type I.

## PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Examine job site conditions and verify field dimensions.
- B. Verify framing for acceptable placement, spacing, and tolerance (alignment and plumb).
- C. Verify that framing and furring are securely attached.
- D. Verify that all blocking, headers, and supports are in place to support plumbing fixtures, grab bars, towel racks, shelves, and similar items.
- E. Verify that insulation is secured.
- F. Verify firestopping work, refer to Section 07 84 00.
- G. Begin installation only when unacceptable conditions have been corrected.

## 3.2 FIRESTOPPING AND SEALANTS

A. Install intumescent moldable pads over backs and sides of all electrical junction and utility boxes at fire rated walls.

B. Apply acoustical sealant at partitions per sealant manufacturer's instructions. Refer to Section 07 92 00.

## 3.3 GYPSUM BOARD INSTALLATION

- A. Install gypsum board to framing and furring members in accordance with manufacturer's recommendations, GA-216 or ASTM C840, and as specified in this Section.
  - 1. Install hi-impact gypsum board at corridors.
  - 2. Install moisture resistant gypsum board at wet/damp areas.
- B. Install gypsum board with separate panels in moderate contact, do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints.
- C. Install gypsum board in most economical direction, using maximum practical lengths, with edges occurring over firm bearing. Install 1/4 inch (nominal) above rough floor or curb. Cut out gypsum board as required to make neat close joints around openings.
- D. In vertical applications, provide lengths required to reach full height of vertical surfaces in one continuous piece.
- E. Where gypsum board is carried full height to structure above, provide for deflection of structure by undercutting board 3/8 inch (nominal) and sealing top edge of board to substrate with a continuous bead of sealant to form an elastic closure.
- F. Use screws to fasten gypsum board to framing.
- G. Treat cut edges and holes in moisture resistant gypsum board per manufacturer's recommendations.
- H. Place corner beads at all exterior corners. Use longest practical length. Place edge trims where gypsum board abuts dissimilar materials.
- I. Control Joints: Install consistent with lines of building spaces and as a minimum, install as follows:
  - 1. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
  - 2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
  - 3. In interior ceilings with perimeter relief so that linear dimensions between control joints do not exceed 50 feet and total area between control joints does not exceed 2500 square feet.
  - 4. In interior ceilings without perimeter relief so that linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 square feet.
  - 5. In exterior ceilings and soffits so that linear dimensions between control joints do not exceed 30 feet and total area between control joints do not exceed 900 square feet.
  - 6. Where ceiling framing members change direction.

7. Where a partition transitions from floor-supported framing to overhead hung framing.

## 3.4 FIRE-RESISTANT ASSEMBLIES

- A. Install fire rated assemblies using materials, application methods including types and spacing of fasteners, and framing in accordance with the specified UL Fire Resistive Design Number, GA-600 File Number, or CBC Table 720.
- B. Completely seal joints of fire-rated gypsum board enclosures in accordance with UL or GA listed assembly requirements. Seal penetrations through rated partitions and ceilings in accordance with tested systems. Refer to Section 07 84 00.

## 3.5 SOUND DAMPING GYPSUM BOARD INSTALLATION

- A. Install sound damping gypsum board in accordance with GA-201, GA-216, GA-600, and manufacturer's instructions.
- B. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 inch to 1/2 inch gaps at these locations, and trim edges with metal edge trim where edges of panels are exposed. Seal joints between edges and abutting structural elements with acoustical sealant. Install backer rods as required to meet the sealant width to depth ratios specified in Section 07 92 00.
- C. Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above ceilings.
- D. Secure gypsum board to metal framing using fine thread drywall screws at 16 inches on center, minimum.
- E. After installing first sheet, apply 1/8 inch to 3/8 inch bead of acoustical sealant on edges of panel around panel perimeter and around electrical boxes. Install adjacent panel squeezing the acoustical sealant in between the two panels. Remove excess acoustical sealant as work progresses.
- F. Install acoustical putty behind outlet boxes and other boxes. Wrap putty completely around the back side of the box, covering entire box.

### 3.6 GYPSUM SHEATHING INSTALLATION

- A. Install gypsum sheathing in accordance with GA-253 and manufacturer's instructions.
- B. End joints, if required should be offset; joints should fit snugly and flashing installed around all openings.
- C. Install maximum lengths possible to minimize number of joints. Edge joints must be located parallel to and with vertical orientation on framing. End joints of adjacent lengths of sheathing must be staggered.

- D. Attach gypsum sheathing to frame with screws. Drive fasteners so as to bear tight against and flush with surface of sheathing. Do not countersink fasteners. Fasteners must be located at least 3/8 inches from edges and ends of sheathing panels.
- E. Do not leave exposed surfaces of gypsum sheathing unprotected beyond the manufacturer's recommendation without a weather barrier cladding.
- F. Building Wrap and Flexible Flashings Installation: Refer to Section 07 25 00.
- 3.7 CEMENTITIOUS BACKER BOARD INSTALLATION
  - A. Install cementitious backer boards in accordance with ANSI A108.11 and manufacturer's instructions.
  - B. Install moisture retarding membrane. Place and fasten boards per manufacturer's instructions.
  - C. Apply boards with ends and edges closely butted but not forced together. Center end or edge joints on framing and stagger joints in adjacent rows.
  - D. Fasten boards to framing using specified fasteners. Drive fasteners into field of board first, working toward ends and edges. Hold boards in firm contact with framing while driving fasteners. Space fasteners maximum 8 inches on center with perimeter fasteners at least 3/8 inch from ends and 5/8 inch from edges.
  - E. Drive screws so bottoms of heads are flush with surface of boards to provide firm panel contact with framing. Do not overdrive screws and replace any screws that are stripped.
  - F. Provide additional blocking where required to permit proper attachment. Edges or ends of unit parallel to framing shall be continuously supported.
- 3.8 JOINT TREATMENT AND FINISH TEXTURE
  - A. Finish gypsum board surfaces in accordance with ASTM C840, GA-214 and GA-216.
  - B. Remove dirt, oil, and other materials that may cause lack of bond from all surfaces to receive joint compound.
  - C. Set mechanical fasteners below the plane of the board.
  - D. Tape, fill, and sand all joints, edges and corners to produce smooth surface ready to receive finishes. Fill all dents, gouges, recesses, or other depressions with joint compound to produce a monolithic surface.
  - E. Feather coats onto adjoining surfaces so that camber is maximum 1/32-inch.
  - F. Spray apply texture on all gypsum board surfaces, unless noted otherwise.
  - G. Levels of Finish: Finish gypsum board surfaces in accordance with GA-214 as follows:

Area	Finish
Plenum areas above ceilings.	Level 1 finish, no texture.

Electrical and mechanical rooms.	Level 2 finish, no texture.	
Moisture resistant gypsum back- ing board (substrate for adhesive applied finish material).	Level 2 finish.	
Light texture (medium orange- peel).	Level 4 finish.	
Smooth finish; satin/eggshell	Level 4 finish.	
paint finish; use: classrooms and offices.	Level 5 finish where critical (severe) lighting condition occurs (refer to GA-214 for description of critical lighting).	
Smooth finish; semi-gloss paint finish; use: restrooms and corridors.	Level 5 finish.	
Heavy-grade wall covering.	Level 3 finish, no texture.	
Wall covering.	Level 4 finish, no texture.	

## 3.9 TOLERANCES

- A. Maximum variation from true flatness: 1/4 inch in 10 feet in any direction.
- B. Maximum surface variation of substrate for walls to receive ceramic tile: Refer to Section 09 30 00.

## 3.10 CLEANING AND PROTECTION

- A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during wallboard application.
- B. Defective Work: Remove and replace defective work that cannot be satisfactorily repaired with no additional cost to the Owner.
- C. Protection: Protect installed work against damage from other construction work.
- D. Upon completion of the work under this Section, remove all surplus material, rubbish and debris from the premises and leave floors broom clean.

END OF SECTION

## SECTION 093013 - CERAMIC TILING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
  - A. Section Includes:
    - 1. Porcelain tile.
  - B. Related Requirements:
    - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
    - 2. Section 092900 "Gypsum Board" for cementitious backer units.

### 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

## 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
- 1.5 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
  - B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
  - C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
  - D. Samples for Verification:
    - 1. Stone thresholds in 6-inch lengths.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Company specializing in installation of ceramic tile, trim units and thresholds with five years' experience with installations of similar scope, materials, and design.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of each type of tile installation, minimum 4 ft. x 4 ft. as directed by Architect.

- 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 3. Ceramic Tile Flooring shall be stable, firm, and slip resistant per compliance with CBC Section 11B-302.1.
- 4. Lippage of tile not to exceed 1/32".

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

## 1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Schluter metal edge strips.

## 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

## 2.3 TILE PRODUCTS

- A. Ceramic Glazed porcelain tile:
  - 1. Basis-of-Design Product: To be confirmed to match existing tile conditions.
  - 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 3. Face Size: As indicated on Sheet A13.0 Finish Schedule, or approved equal.
  - 4. Thickness: As indicated on Sheet A13.0 Finish Schedule, or approved equal.
  - 5. Face: As indicated on Sheet A13.0 Finish Schedule, or approved equal.
  - 6. Grout Color: As selected by Architect from manufacturer's full range.
  - 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.
    - a. Provide shapes as indicated on drawings.

## 2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 10 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
  - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

## 2.5 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Custom Building Products.
    - b. LATICRETE SUPERCAP, LLC.
    - c. MAPEI Corporation.
  - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

## 2.6 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Custom Building Products.
    - b. LATICRETE SUPERCAP, LLC.
    - c. MAPEI Corporation.

## 2.7 MISCELLANEOUS 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.
- 2.8 MIXING MORTARS AND GROUT
  - A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
  - B. Add materials, water, and additives in accurate proportions.
  - C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of 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.

## 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Glazed Wall Tile: 1/16 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- K. Metal Edge Strips: Install at locations indicated.

## 3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

## 3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

### 3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

## 3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Wood or Metal Studs or Furring:
  - 1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
    - a. Thinset Mortar: Modified dry-set mortar.
    - b. Grout: High-performance unsanded grout.

END OF SECTION 093013

### SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### 1.1 SUMMARY

A. This Section includes acoustical panels and suspension systems for ceilings.

#### 1.2 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical panel ceilings that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
  - 2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 3. Warranty Period: 1 year.
  - 4. Installer's Warranty: 1 year.

#### 1.3 MANUFACTURERS

- A. Acoustical Panels: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
  - 1. Armstrong World Industries, Inc.
  - 2. Conwed
  - 3. Geometrik
  - 4. Woodfit Acoustics
  - 3. Or equal.

B. Suspension Systems: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.

- 1. Armstrong World Industries, Inc.
- 2. Conwed
- 3. Geometrik
- 4. Woodfit Acoustics
- 5. Or equal.

### 1.4 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

### 1.5 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Acceptable Product (ACT-1): Armstrong Optima
  - 1. Surface Texture: Fine
  - 2. Composition: Mineral Fiber
  - 3. Color: White
  - 4. Size: Tegular Model 3152, 2'x2'x1".
  - 5. Noise Reduction Coefficient (NRC): 0.95
  - 6. Fire Rating: Class A

C. Or equal.

#### 1.6 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: In accordance with the 2019 California Building Code, Section 1616 for Category D, E, and F.
- D. Wire for Hangers and Ties: In accordance with the 2019 California Building Code, Section 1616.
- E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- J. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- L. Wall Moldings: In accordance with the 2019 California Building Code, Section 1616 for Category D, E. and F.

### 1.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Exposed Steel Suspension System: Formed galvanized steel, commercial quality cold rolled; heavy-duty.
  - 1. Product: Armstrong Prelude or equal.
    - a. Profile: Tegular; 15/16 inch wide face.
    - b. Finish: Factory painted white.
  - 2. Product: Armstrong Lyra Concealed or equal
    - a. Profile: Quick Kerf Edge
    - b. Finish: Factory painted white

## 1.8 METAL EDGE MOLDINGS AND TRIM

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

### 1.9 ACOUSTICAL SEALANT

A. Comply with requirement of Division 7 "Joint Sealants".

END OF SECTION 095113

### SECTION 096513 - RESILIENT BASE AND ACCESSORIES

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Thermoset-rubber base.
  - 2. Rubber molding accessories.

#### 1.3 ACTION SUBMITTALS

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

### 1.4 MAINTENANCE MATERIAL SUBMITTALS

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

### 1.5 DELIVERY, STORAGE, AND HANDLING

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

#### 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.

recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

#### PART 2 - PRODUCTS

### 2.1 THERMOSET-RUBBER BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
  - 2. Flexco.
  - 3. Roppe Corporation, USA.
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
  - 1. Style and Location:
    - a. Style B, Cove: Provide in areas with resilient floor coverings.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As indicated on drawings.

#### 2.2 RUBBER MOLDING ACCESSORY

- A. Description: Rubber carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet, transition strips.
- B. Profile and Dimensions: As indicated.
- C. Locations: Provide rubber molding accessories in areas indicated.
- D. Colors and Patterns: As selected by the architect from manufacturer's full range.

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

adjacent pieces aligned.

- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
  - 1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.

#### 3.4 RESILIENT ACCESSORY INSTALLATION

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

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum horizontal surfaces thoroughly.
  - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

### SECTION 096519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid vinyl floor tile (LVT).

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

## 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

### 1.9 FIELD CONDITIONS

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

# PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with California Building Code, Section 11B-302.1.
  1. Resilient flooring shall be stable, firm and slip resistant.
- B. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. ASTM E 662/NFPA 258 (Smoke Density), less than 450.
- 2.2 SOLID VINYL FLOOR TILE

- A. Basis-of-Design: As indicated on drawings.
- C. Construction: LVT (Luxury Vinyl Tile)
- D. Thickness: Manufacturer's standard thickness for size indicated, 0.160 inch (4mm), minimum.
- E. Size: As indicated on drawings.
- F. Installation Method: Glue down.
- G. Colors and Patterns: As indicated on drawings.

### 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.

- 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 9 pH.

- 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas. Where moisture emissions are above manufacturer's recommendations, provide products as indicated in Section 09 0561.13 "Moisture vapor Emissions Control" and re-test the substrate.
  - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
  - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

## 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

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- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

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- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

## 3.4 CLEANING AND PROTECTION

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

END OF SECTION 096519

# SECTION 096816 - SHEET CARPETING

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
  - A. Section Includes:
    - 1. Woven carpet.
    - 2. Carpet cushion.
  - B. Related Requirements:
    - 1. Section 096813 "Tile Carpeting" for modular carpet tiles.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to carpet installation including, but not limited to, the following:
    - a. Review delivery, storage, and handling procedures.
    - b. Review ambient conditions and ventilation procedures.
    - c. Review subfloor preparation procedures.

# 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written data on physical characteristics and durability.
  - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Sustainable Design Submittals:

- 1. <u>Product Data</u>: For adhesives, indicating VOC content.
- 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- 3. <u>Laboratory Test Reports</u>: For flooring products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For carpet installation, showing the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
  - 2. Carpet type, color, and dye lot.
  - 3. Locations where dye lot changes occur.
  - 4. Seam locations, types, and methods.
  - 5. Type of subfloor.
  - 6. Type of installation.
  - 7. Pattern type, repeat size, location, direction, and starting point.
  - 8. Pile direction.
  - 9. Types, colors, and locations of insets and borders.
  - 10. Types, colors, and locations of edge, transition, and other accessory strips.
  - 11. Transition details to other flooring materials.
  - 12. Type of carpet cushion.
- D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet: 12-inch- (300-mm-) square Sample.
  - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
  - 3. Carpet Cushion: 6-inch- (150-mm-) square Sample.
  - 4. Carpet Seam: 6-inch (150-mm) Sample.
  - 5. Mitered Carpet-Border Seam: 12-inch- (300-mm-) square Sample. Show carpet pattern alignment.
- E. Samples for Initial Selection: For each type of product.
  - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- F. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet: 12-inch- (300-mm-) square Sample.
  - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
  - 3. Carpet Cushion: 6-inch- (150-mm-) square Sample.
  - 4. Carpet Seam: 6-inch (150-mm) Sample.
  - 5. Mitered Carpet-Border Seam: 12-inch- (300-mm-) square Sample. Show carpet pattern alignment.

- G. Product Schedule: For carpet and carpet cushion. Use same designations indicated on Drawings.
- H. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.
- 1.5 INFORMATIONAL SUBMITTALS
  - A. Qualification Data: For Installer.
  - B. Product Test Reports: For carpet and carpet cushion, for tests performed by a qualified testing agency.
  - C. Sample Warranties: For special warranties.

# 1.6 CLOSEOUT SUBMITTALS

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

# 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

# 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockups at locations and in sizes shown on Drawings.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- 1.9 DELIVERY, STORAGE, AND HANDLING
  - A. Comply with CRI's "CRI Carpet Installation Standard."
  - B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.
- 1.10 FIELD CONDITIONS
  - A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
  - B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
  - C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
  - D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

# 1.11 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, the following:
    - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
    - b. Loss of tuft bind strength.
    - c. Excess static discharge.
    - d. Delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty includes removal and replacement of carpet and accessories required by replacement of carpet cushion.
  - 2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 3. Failure includes, but is not limited to, permanent indentation or compression.
  - 4. Warranty Period: 10 years from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 WOVEN CARPET

- A. Carpet Tile:
  - 1. Basis-of-Design Product: To be confirmed with existing carpeting.
- B. Backing: Flexaire Cushion Pad and Binding Edges or equal.
- C. Applied Treatments:
  - 1. Applied Soil-Resistance Treatment: Manufacturer's standard material.
  - 2. Antimicrobial Treatment: Manufacturer's standard material.
    - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for grampositive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
- D. Sustainable Design Requirements:
  - 1. Sustainable Product Certification: Platinum level certification according to ANSI/NSF 140.
- E. Performance Characteristics:
  - 1. Appearance Retention Rati ng: Heavy traffic, 3.0 minimum according to ASTM D7330.
  - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
  - 3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D2646.
  - 4. Noise Reduction Coefficient (NRC): according to ASTM C423.
  - 5. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
  - 6. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
  - 7. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
  - 8. Carpet shall be securely attached and shall have firm cushion, pad, or backing, or no cushion or pad. It shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height shall be 1/2" maximum.
  - 9. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length. Carpet edges shall comply with CBC Section 11B-303.

# 2.2 CARPET CUSHION

- A. Traffic Classification: CCC Class II, heavy traffic.
- B. Cushion: Manufacturer's commercial standard.

- C. Performance Characteristics:
  - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
  - 2. Noise Reduction Coefficient (NRC): according to ASTM C423.

# 2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cementbased formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI's "CRI Carpet Installation Standard."
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- c. Perform additional moisture tests recommended in writing by adhesive, carpet cushion, and carpet] manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive, carpet, and carpet cushion] manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

# 3.3 CARPET INSTALLATION

- A. Comply with CRI's "CRI Carpet Installation Standard" and carpet and carpet cushion manufacturers' written installation instructions for the following:
  - 1. Direct-glue-down installation.
  - 2. Double-glue-down installation.
  - 3. Carpet with attached-cushion installation.
  - 4. Preapplied adhesive installation.
  - 5. Hook-and-loop installation.
  - 6. Stretch-in installation.
  - 7. Stair installation.
- B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
  - 1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.
- C. Install as indicated on Drawings.

- D. Install borders with mitered corner seams.
- E. Do not bridge building expansion joints with carpet.
- F. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- G. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.
- 3.4 CLEANING AND PROTECTION
  - A. Perform the following operations immediately after installing carpet:
    - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
    - 2. Remove yarns that protrude from carpet surface.
    - 3. Vacuum carpet using commercial machine with face-beater element.
  - B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."
  - C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and carpet cushion and adhesive manufacturers.

END OF SECTION 096816

# SECTION 098400 - ROOM ACOUSTIC COMPONENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
  - 1. Fabric wrapped sound-absorbing wall and ceiling panels.

## B. Related Requirements:

- 1. Division 09 Section "Gypsum Board."
- 2. Division 09 Section "Acoustical Panel Ceilings."
- 3. Division 09 Section "Acoustic Insulation"

C. Fabric Selections indicated on Drawing Sheet A12.01 Interior Schedules

### 1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

#### 1.4 COORDINATION

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

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- 1.6 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
    - 1. Include fabric/veneer facing, panel edge, core material, and mounting indicated.
  - B. Shop Drawings: For unit assembly and installation.
    - 1. Include plans, elevations, sections, and mounting devices and details.
    - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
    - 3. Include details at cutouts and penetrations for other work.
    - 4. Include direction of fabric weave and pattern matching.
  - C. Samples for Initial Selection: For each type of fabric facing.
    - 1. Include Samples of hardware and accessories involving color or finish selection.
  - D. Samples for Verification: For the following products:
    - 1. Fabric: Full-width by approximately 36-inch- (900-mm-) long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
    - 2. Panel Edge: 12-inch- (300-mm-) long Sample(s) showing each edge profile, corner, and finish.
    - 3. Core Material: 12-inch- (300-mm-) square Sample at corner.
    - 4. Mounting Devices: Full-size Samples.

### 1.7 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Electrical outlets, switches, and thermostats.
  - 2. Items penetrating or covered by units including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Alarms.
    - e. Sprinklers.
    - f. Access panels.
  - 3. Show operation of hinged and sliding components covered by or adjacent to units.
- B. Product Certificates: For each type of unit.
- C. Sample Warranty: For manufacturer's special warranty.

## 1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

### 1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 sq. yd. (9 sq. m), full width of bolt.
  - 2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

#### 1.10 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

#### 1.12 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wetwork in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.

- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

## 1.13 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to the following:
    - a. Acoustical performance.
    - b. Fabric sagging, distorting, or releasing from panel edge.
    - c. Warping of core.
  - 2. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations:
  - 1. Obtain fabric wall and ceiling units specified in this Section from single source from single manufacturer.
  - 2. Obtain perforated wood wall units and non-perforated wood wall units specified in this Section from single source from single manufacturer.
  - 3. Obtain PET wall and ceiling units specified in this Section from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.
  - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

## 2.3 ACOUSTIC WALL AND CEILING PANELS

- A. Fabric-Faced Sound Absorbing Panels (AP-01, AP-02): Sound absorbing wall and ceiling panels shall be provided. Panels shall be glass or mineral fiber with a density of 6 to 7 PCF. Bonded to this on the front side shall be a 1/8-inch-thick high-density glass fiberboard (if glass fiber core material is used). Edges of the panels shall be reinforced with resin or shall be protected with a framing strip, in order to make the panels damage resistant, inert, and dimensionally stable. Unless specified otherwise, edges shall be true and square.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, fabric-faced sound absorbing panels by one of the following manufacturers:
    - a. Conwed
    - b. Decoustics Limited
    - c. Kinetics Noise Control
    - d. MBI Products Company
    - e. Perdue Acoustics
  - 2. Thickness: As indicated on Drawings.
  - 3. Noise Reduction Coefficient:
    - a. 1-inch panels: 0.80 minimum
    - b. 2-inch panels: 0.95 minimum
    - c. 4-inch panels: 0.99 minimum
  - 4. Fabric: As indicated on Interior Schedules
  - 5. Core: Glass or mineral fiber with a density of 6 to 7 PCF
  - 6. Flammability: ASTM E84, Class A.

## 2.4 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.
- C. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
  - 1. Square Corners: Tailor corners.
  - 2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
  - 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.
- E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:
  - 1. Thickness.
  - 2. Edge straightness.
  - 3. Overall length and width.
  - 4. Squareness from corner to corner.
  - 5. Chords, radii, and diameters.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fabric, fabricated units, veneers, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align fabric pattern and grain with adjacent units and as indicated on Drawings.

## 3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch (1.6-mm) variation from hairline in 48 inches (1200 mm), noncumulative.

### 3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 098400

SECTION 09 91 00 - PAINTING

- PART 1 GENERAL
- 1.1 SECTION INCLUDES
  - A. Surface preparation.
  - B. Painting schedules, including painting of exposed surfaces, interior and exterior, except as otherwise specified or indicated.

## 1.2 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes.
- C. Related Requirements:
  - 1. Section 221110 "Facility Natural-Gas Piping" for coordination of painting exposed steel pipes.
- D. Referenced Standards, Manuals and Codes:
  - 1. ASTM D523 Standard Test Method for Specular Gloss.
  - 2. The Master Painters Institute, MPI Gloss and Sheen Levels.
  - 3. The Master Painters Institute, MPI Maintenance Repainting Manual.

## 1.3 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Provide product data on all finishing products.
- C. Submit four brush-out samples 8 inches by 10 inches in size illustrating color selected for each surface finishing product scheduled.
- D. Field Sample: Furnish sample of actual paint colors selected on portion of building item to receive paint prior to beginning interior and exterior painting.

## 1.4 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.
- B. Applicator: Company specializing in commercial painting and finishing with sufficient documented experience.

C. Gloss Levels: Per Master Painters Institute (MPI) gloss standards "MPI Gloss and Sheen Levels," measured in accordance with ASTM D523.

GLOSS LEVEL	DESCRIPTION	SCRIPTION GLOSS AT 60 DEGREES ASTM D523	
G1	A traditional matte finish – flat.	5 units, maximum	and 10 units, maximum
G2	A high side sheen flat - "a velvet- like" finish.	10 units, maximum	and 10 - 35 units
G3	A traditional "eggshell-like" finish.	10 - 25 units	and 10 - 35 units
G4	A "satin-like" finish.	20 - 35 units	and 35 units, minimum
G5	A traditional semi-gloss.	35 - 70 units	-
G6	A traditional gloss.	70 - 85 units	-
G7	A high gloss.	More than 85 units	-

D. Previously Painted Surfaces Requiring Repainting: Surface preparation, priming, and paint application shall conform to applicable requirements of MPI Maintenance Repainting Manual.

# 1.5 REGULATORY REQUIREMENTS

- A. Conform to California Building Code for flame spread and smoke density requirements for finishes.
- B. Furnish certification that all paint coatings furnished for the location of the project comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings applied in California as designated by California Air Resources Board (CARB).

# 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in manufacturer's original unopened, labeled containers; inspect to verify acceptance.
- B. Store and protect products from abuse and contamination.
- C. Container labeling is to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.
- 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior work and interior work, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

# 1.8 EXTRA STOCK

- A. Provide a new and unopened one-gallon container of each type, color and sheen to Owner.
- B. Label each container with color, in addition to the manufacturer's label.

# PART 2 PRODUCTS

- 2.1 PAINT SYSTEMS, GENERAL
  - A. Material Compatibility:
    - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
    - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- 2.2 ACCEPTABLE MANUFACTURERS PAINT
  - A. Refer to Table at the end of this Section.
  - B. Substitutions: Under provisions of Division 01.
- 2.3 ACCEPTABLE MANUFACTURERS PRIMER SEALERS
  - A. Refer to Table at the end of this Section.
  - B. Substitutions: Under provisions of Division 01.
- 2.4 ACCEPTABLE MANUFACTURERS STAIN AND CLEAR FINISHES
  - A. Refer to Table at the end of this Section.
  - B. Substitutions: Under provisions of Division 01.
- 2.5 MATERIALS
  - A. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.
  - B. Coatings: Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.

- C. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

# 2.6 FINISHES

A. Finish colors to match field conditions.

# PART 3 EXECUTION

# 3.1 INSPECTION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Plaster; Gypsum Wallboard: 18 percent.
  - 2. Concrete Masonry Units: 10 percent.
  - 3. Interior Located Wood: 15 percent.
  - 4. Exterior Located Wood: 7 percent.
- D. Beginning of application constitutes acceptance of existing surfaces.

# 3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or painting.
- B. Correct minor defects and clean surfaces that affect work of this Section.
- C. Seal marks that may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Gypsum Board Surfaces: Latex fill minor defects. Spot-prime defects after repair.
- F. Galvanized Surfaces: Remove passivators, oil, grease, acid residue, and surface contamination; wash with solvent. Apply coat of etching primer, unless otherwise recommended by finish coating system manufacturer.
- G. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces as recommended by primer manufacturer. Prime shop-primed steel items with steel primers specified in this Section.

- H. Interior Wood Items Scheduled to Receive Finish: Hand sandpaper and wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
  - 1. At woodwork with transparent finish, nail holes, cracks or defects shall be filled with wood filler tinted to match color of stain.
- I. Previously Painted Surfaces: Existing conditions vary. Evaluate degree of surface degradation. Surface preparation methods shall conform to applicable requirements of MPI Maintenance Repainting Manual.

# 3.3 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

# 3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
  - 1. Paint mil thicknesses shall not be less than the minimums recommended by the paint manufacturers.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Prime back surfaces of interior and exterior woodwork with primer paint, type as recommended by manufacturer.
- I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- J. Previously Painted Surfaces: Priming shall conform to applicable requirements of MPI Maintenance Repainting Manual.
- 3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT
  - A. See Divisions 21 23 and 25 28 for other items requiring painting.

- B. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one) coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels. Paint all new interior and exterior exposed ductwork and ductwork supports. Paint all new conduit, pipes and conduit/pipe supports in exposed interior and exterior locations.
- C. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.
- D. Do not paint factory-finished mechanical and electrical equipment.

# 3.6 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed or spattered.
- B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove from site daily.
- 3.7 PAINTING SCHEDULE EXTERIOR SURFACES: Descriptions in schedule apply to new and previously painted surfaces, except surface preparation and priming of previously painted surfaces shall be in accordance with applicable requirements of MPI Maintenance Repainting Manual.
  - A. Ferrous Metal
     1st coat Acrylic Flat Primer
     2nd and 3rd coats 100 percent Acrylic Semi-Gloss
  - B. Ferrous Metal (Industrial)
    1st coat Epoxy Flat Primer
    2nd and 3rd coats Aliphatic Urethane Gloss Enamel
    For use at exterior metal architectural features/exposed structure
  - C. Galvanized Metal (Handrail and Guardrail Assemblies only) 1st coat – Etch Prep 2nd coat – Epoxy Satin Primer 3rd and 4th coats – High Dispersion Pure Acrylic Polymer
  - D. Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies) 1st coat – Etch Prep 2nd coat – Acrylic Flat Primer 3rd and 4th coats – 100 percent Acrylic Semi-Gloss
  - E. Cement Plaster with Acrylic Finish Coat 1st coat – Acrylic Flat Primer 2nd and 3rd coats – Elastomeric Flat
  - F. Cement Plaster and Exposed Concrete 1st coat – Acrylic Flat Primer

2nd and 3rd coats - Elastomeric Flat

- G. Wood
  1st coat Acrylic Flat Primer
  2nd and 3rd coats 100 percent Acrylic Flat
- H. Fiber-Reinforced Cement Siding, Paneling and Trim 1st coat – Acrylic Primer
   2nd and 3rd coats – 100 percent Acrylic Satin
- Wood 1st coat – Acrylic Flat Primer 2nd and 3rd coats – 100 percent Acrylic Semi-Gloss
- J. Pressure Treated Wood
   1st coat Acrylic Flat Primer
   2nd and 3<sup>rd</sup> coats 100 percent Acrylic Satin or 100 percent Acrylic Semi-Gloss
- K. Masonry (CMU)
   1st coat Acrylic Block Filler Primer
   2nd and 3<sup>rd</sup> coats 100 percent Acrylic Flat
- 3.8 PAINTING SCHEDULE INTERIOR SURFACES: Descriptions in schedule apply to new and previously painted surfaces, except surface preparation and priming of previously painted surfaces shall be in accordance with applicable requirements of MPI Maintenance Repainting Manual.
  - A. Gypsum Board

1st coat – PVA Primer Sealer Texture by Section 09 29 00 Contractor 2nd coat – PVA Primer Sealer 3rd and 4th coats – Latex Semi-Gloss Enamel Typical paint system at toilet rooms, storage rooms, kitchen.

- B. Gypsum Board
  1st coat PVA Primer Sealer
  Texture by Section 09 29 00 Contractor
  2nd coat PVA Primer Sealer
  3rd and 4th coats Latex Eggshell Enamel
- C. Wood (Opaque Finish)
   1st coat Acrylic Flat Primer
   2nd and 3rd coats Latex Semi-Gloss Enamel
- D. Ferrous Metal
   1st coat Acrylic Flat Primer
   2nd and 3rd coats Latex Semi-Gloss Enamel
   Typical paint system at all hollow metal doors and pressed metal frames.
- E. Concrete

1st coat – Acrylic Flat Primer 2nd and 3rd coats – Latex Semi-Gloss Enamel

- F. Masonry (CMU) 1st coat – Acrylic Block Filler Primer 2nd and 3rd coats – Latex Semi-Gloss Enamel
- G. Existing Acoustical Ceiling Tiles 1st coat - Latex Flat Enamel
- H. Wood (Transparent Finish)
  1st coat Alkyd Flat Stain
  2nd coat Alkyd Semi-Gloss Sanding Sealer
  3rd and 4th coats Alkyd Satin Polyurethane Varnish or Alkyd Gloss Polyurethane Varnish
- Galvanized Metal, Zinc Alloy Metal and Aluminum 1st coat – Etch Prep 2nd coat – Acrylic Flat Primer 3rd and 4th coats – Latex Semi-Gloss Enamel

			MANUFACTURERS				
APPLICATION	TYPE	MPI Gloss	Dunn Edwards	-	Sherwin Williams	-	Tnemec
PRIMERS		Level	1				
Exterior Ferrous Metal	Acrylic	G1	BRPR00-1	-	B66W00310	-	-
Exterior Ferrous Metal (Industrial)	Ероху	G1	5300 Rustoleum	-	B58W00620	-	-
Exterior Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)	Acrylic	G1	W715	-	B66W00310	-	-
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	Ероху	G1	-	-	B58W00620	-	V69
Exterior Wood and Pressure Treated Wood	Acrylic	G1	EZPR00	-	B42W8041	-	-
Exterior Cement Plaster System with Acrylic Finish Coat and Acrylic Soffit Finish	Acrylic	G1	W709	-	A24W351	-	-
Exterior Fiber-Reinforced Cement Siding and Trim, Cement Plaster and Concrete; Interior Concrete	Acrylic	G1	ESPR00	-	A24W08300	-	-
Exterior and Interior Masonry (Block Filler)	Acrylic	G1	W315	-	B25W25	-	-
Zero VOC Interior Gypsum Board and Wood	Acrylic	G1	ENSO00	-	B79W4158	-	-
Interior Gypsum Board	PVA	G1	W101	-	B28W00600	-	-
Interior Wood	Acrylic	G1	W6325	-	B28W8111	-	-
Interior Ferrous Metal	Acrylic	G1	BRPR00	-	B66W00310	-	-
Interior Galvanized Metal	Acrylic	G1	UGPR00 or W8	-	B66W00310	-	-
FINISHES							
Exterior Ferrous and Galvanized Metal, Aluminum, Wood and Pressure Treated Wood (Except Handrail and Guardrail Assemblies)	100 percent Acrylic	G5	EVSH50	-	A08W00151	-	-
Exterior Ferrous Metal (Industrial)	Aliphatic Urethane Enamel	G6	Carbothane 134MC	-	B65W00300	-	-
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	High Dispersion Pure Acrylic	G5	-	-	B66W00600	-	1029
Exterior Cement Plaster with Acrylic Finish Coat, Concrete, and Acrylic Soffit Finish	Elastomeric	G1	W-370	-	A05W00451	-	-
Exterior Cement Plaster and Concrete	Elastomeric	G1	W370	-	A05W00451	-	-
Exterior Wood and Masonry	100 percent Acrylic	G1	EVSH10	-	A100-A6	-	-
Exterior Fiber-Reinforced Cement Siding and Trim and Pressure Treated Wood	100 percent Acrylic	G4	EVSH30	-	A100-A82	-	-
Zero VOC Interior Gypsum Board and Wood	100 percent Acrvlic	G1	ENSO10	-	B30W02651	-	-
Zero VOC Interior Gypsum Board and Wood	100 percent Acrylic	G3	ENSO30	-	B20W02651	-	-
Zero VOC Interior Gypsum Board and Wood	100 percent Acrylic	G5	ENSO50	-	B31W02651	-	-
Interior Gypsum Board, Wood, Ferrous Metal, Concrete, Masonry, and Galvanized Metal	Latex Enamel	G5	SPMA50	-	B31W02651	-	-
Interior Gypsum Board	Latex Enamel	G3	SPMA30	-	B20W02651	-	-
Interior Existing Acoustical Ceiling Tiles	Latex Enamel	G1	W615	-	B30W02651	-	-
							1

MISCELLANEOUS					-		
Interior Wood Stain	Alkyd	G1	V109	ZAR Ultra Max Wood Stain	A49R00802	2900	-
Interior Wood Sanding Sealer	Alkyd	G5	MC80-6200 McCloskey	ZAR Ultra Max Sanding Sealer	B26V00043	Gemini Gem Coat 210-0022	-
Interior Wood Varnish	Acrylic Urethane	G4	MC80-6841 McCloskey	ZAR Ultra MAX Satin	A68F00090	2097	-
Interior Wood Varnish	Acrylic Urethane	G5		ZAR Ultra Max Semi- Gloss	A68V00091	2094	-
Exterior Heavy Duty Cleaner	Water-Based	N/A		88		Jasco Prep & Prime	-
Exterior and Interior Galvanized Metal Etch Prep.	N/A	N/A	Dissco Eco-Prime 100 or Jasco Prep & Prime				

END OF SECTION

# SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

- 1.01 SUMMARY
  - A. Provisions of Division 01 apply to this section.
- 1.02 Section Includes:
  - A. Interior and exterior accessibility and identification signs.
  - B. Interior directories.
  - C. Exterior directional signs.
  - D. Dimensional characters.

### 1.03 References

- A. CAS/CAR California Accessibility Statutes and California Accessibility Regulations current edition of CBC.
- B. California Building Code.
- C. Chapter 3, Title 19, CCR.
- D. ASTM D4802-02 Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.
- E. A B209-04 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- F. ASTM B221-04a Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. California Fire Code, Article 79 Flammable and Combustible Liquids Section 7901, 9701.9 Labeling and Signs.
- H. California fire code, Article 64 Stationary Lead- Acid Battery Systems Section 6401 and 6404.7 Signs.
- I. CBC Chapter 7, Fire Resistant Materials and Construction 713.13 Signs.
- J. Uniform Sign Code Book.

### 1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.
- B. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.
- C. Manufacturer's installation instructions.

# 1.05 REGULATION REQUIREMENTS

- A. Comply with CBC Sections 11B-703. Nothing in this specification shall be construed to relieve the Contractor of complying with all applicable codes.
- B. Color of symbol: The international symbol of accessibility shall consist of blue equal to Color No. 15090 in Federal Standard 595C, CBC 11B-703.7.2.1.

- C. Signage and Graphics:
  - 1. Raised characters shall comply with CBC Section 11B-703.2.
    - a. Depth: It shall be 1/32 inch minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
    - b. Height: It shall be 5/8" minimum and 2 inches maximum based on the height of the uppercase letter "i". CBC Section 11B-703.2.5.
    - c. Finish and Contrast: Characters and their background shall have non-glared finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section 11B-703.5.1.
    - d. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Section 11B-703.4 and 11B-703.6.
    - e. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.
    - f. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B-703.3 and 11B-703.4. Braiile dots shall have domed and rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
    - g. Mounting Height: A tactile sign shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.
    - h. Mounting Location: A tactile sign shall be located on the approach side, as one enters or exits rooms or space, and be reached within 0" of the required clear floor space per CBC Section and Figure 11B-703.4.2 as follows:
      - 1) a clear floor space of 18" x 18" minimum, centered on the tactile characters, shall be provided beyond the arc of any door swings between the closed position and 45 degree open position.
      - 2) on the wall at the latch side of a single door.
      - 3) on the inactive leaf of a double door with one active leaf.
      - 4) on the wall at the right side of a double door with two active leafs
      - 5) on the nearest adjacent wall where there is no wall space at the latch side of a single door or no space at the right side of a double door with two active leafs.
  - 2. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40" minimum above finish floor or ground.
  - 3. Pictograms shall comply with CBC Section 11B-703.6.
  - 4. Symbol of accessibility shall comply with CBC Section 11B-703.7.

### 1.06 PRE-INSTALLATION CONFERENCE

- A. Notify Architect when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until Architect's approval of specific locations and methods of attachment has been obtained.
- B. Provide signs from one manufacturer, unless otherwise approved.

## 1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and protect from damage. Store until immediately prior to Notice of Completion.

## 1.08 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
- C. Warranty Period: Two (2) years from Notice of Completion.

## PART 2 - PRODUCTS

- 2.01 GENERAL
  - A. Refer to drawings for additional information for signage types and locations.

## 2.02 MANUFACTURERS

- A. Products of following manufacturers form basis for design and quality intended.
  - 1. ASI (as-basis-of design)
    - a. Infinity Series.
    - b. SignEtch I and II Series.
    - c. Compass Series.
    - d. SP Series.
  - 2. Or Equal.

### 2.03 ROOM IDENTIFICATION SIGNAGE - INTERCHANGEABLE

- A. Interior modular interchangeable signs mounted on perforated chassis backer; Infinity Series by ASI.
- B. Chassis: Material: Cold rolled, low carbon steel, die perforated 18 ga. sheet with high temperature cured powder coating.
- C. Module Attachment and Registration:
  - 1. PresTab<sup>™</sup>: Permanently mounted attachment, injection molded black nylon.
- D. Manufacturing tolerance: +/- 0.008 in.
- E. ADA-Ready<sup>™</sup> Panels: Material: Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's phenolic photopolymer bonded process. Signface of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.
  - 1. Finish: Two-component high temperature cured polyester coating per manufacturer's standard for phenolic photopolymer material.
  - 2. Panel size: As indicated on drawings.
  - 3. Panel colors: To be selected by Architect from manufacturer's standard.
  - 4. Text or graphic colors: To be selected by Architect from manufacturer's standard.
  - 5. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.

- 6. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- F. Graphic Panels:
  - 1. Material: Aluminum alloy per manufacturer's standard.
  - 2. Finish: Two-component polyester coating per manufacturer's standard.
  - 3. Panel size: As indicated on drawings.
  - 4. Panel colors: To be selected by Architect from manufacturer's standard.
  - 5. Text or graphic colors: To be selected by Architect from manufacturer's standard.
  - 6. Graphic technique: Print on Panel (POP).
  - 7. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- G. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- H. Accessories: Provide manufacturer's standard accessories as follows:
  - 1. WindowSign<sup>™</sup>. Material: Extruded aluminum and painted.
  - 2. Notebar<sup>™</sup>. Material: Extruded aluminum and painted.
  - 3. Mounting: Wall Mounted with bond, closed cell tape.
- I. Locations: All interior rooms except utility rooms. Refer to drawings for locations.

### 2.04 ROOM IDENTIFICATION SIGNAGE - PERMANENT

- A. Interior modular permanent signs mounted on perforated chassis backer; Infinity Series by ASI.
- B. Chassis: Material: Cold rolled, low carbon steel, die perforated 18 ga. sheet with high temperature cured powder coating.
- C. Module Attachment and Registration:
  - 1. PresTab<sup>™</sup>: Permanently mounted attachment, injection molded black nylon.
- D. Manufacturing tolerance: +/- 0.008 in.
- E. ADA-Ready<sup>™</sup> Panels: Material: Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's phenolic photopolymer bonded process. Signface of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.
- F. Finish: Two-component high temperature cured polyester coating per manufacturer's standard for phenolic photopolymer material.
- G. Panel size: As indicated on drawings.
- H. Panel colors: To be selected by Architect from manufacturer's standard.
- I. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- J. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- K. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- L. Graphic Panels:

- 1. Material: Aluminum alloy per manufacturer's standard.
- 2. Finish: Two-component polyester coating per manufacturer's standard.
- 3. Panel size: As indicated on drawings.
- 4. Panel colors: To be selected by Architect from manufacturer's standard.
- 5. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- 6. Graphic technique: Print on Panel (POP).
- 7. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- 8. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- M. Linear Accents: Provide manufacturer's standard linear accents as follows:
  - 1. Type A-Square. Material: Aluminum alloy. Finish: High Temperature Cured Polyester Coating.
- N. Mounting: Wall Mounted with bond, closed cell tape.
- O. Locations: All interior rooms, except rooms to receive interchangeable room identification signs. Refer to drawings for locations.

## 2.05 ROOM IDENTIFICATION - EXTERIOR

- A. ADA-Ready<sup>™</sup> Panels; SignEtch I Series by ASI.
- B. Base Material: Zinc, in 0.125 inch thickness. Photochemically-Etched ADA panels.
- C. Paint: Primer and urethane based color coat, of type standard with manufacturer with U.V. resistant clear urethane top coat.
- D. Tactile Graphics and Text:
  - 1. Fabrication process: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's photochemical etching.
- E. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
- F. Edge Detail: Square
- G. Edge Finish: Painted.
- H. Panel size: As indicated on drawings.
- I. Panel colors: To be selected by Architect from manufacturer's standard.
- J. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- K. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- L. Type A-Square. To be selected by Architect from manufacturer's standard.
- M. Mounting: VT, vinyl tape and SA, silicone adhesive.

### 2.06 INTERIOR DIRECTORIES

A. Interior directories mounted on perforated chassis backer; Infinity Series by ASI.

- B. Chassis: Material: Cold rolled, low carbon steel, die perforated 18 ga. sheet with high temperature cured powder coating.
- C. Module Attachment and Registration:
  - 1. LocTab<sup>™</sup>: Tamper resistant attachment, injection molded black nylon.
- D. Manufacturing tolerance: +/- 0.008 in.
- E. Size: As indicated on drawings.
- F. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- G. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- H. Graphic Panels:
  - 1. Material: Aluminum alloy per manufacturer's standard.
  - 2. Finish: Two-component polyester coating per manufacturer's standard.
  - 3. Panel size: As indicated on drawings.
  - 4. Panel colors: To be selected by Architect from manufacturer's standard.
  - 5. Text or graphic colors: To be selected by Architect from manufacturer's standard.
  - 6. Graphic technique: LTV vinyl process. To be selected by Architect from manufacturer's standard.
  - 7. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
  - 8. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- I. Accessories:
  - 1. Spare Panels.
- J. Linear Accents: Provide manufacturer's standard linear accents as follows:
  - 1. Type A-Square. To be selected by Architect from manufacturer's standard.
- K. Mounting: System shall have a concealed locking method to increase level of tamper resistant.
- L. Locations: As indicated on drawings. Provide directories for all floor levels on the first floor. For second floor, provide directory for its own floor level.

## 2.07 EMERGENCY EVACUATION MAPS

- A. Interior modular interchangeable signs mounted on perforated chassis backer; Infinity Series by ASI.
- B. Chassis: Material: Cold rolled, low carbon steel, die perforated 18 ga. sheet with high temperature cured powder coating.
- C. Module Attachment and Registration:
  - 1. PresTab<sup>™</sup>: Permanently mounted attachment, injection molded black nylon.
- D. Manufacturing tolerance: +/- 0.008 in.
- E. ADA-Ready<sup>™</sup> Panels: Material: Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's phenolic photopolymer bonded process. Signface of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.

- F. Finish: Two-component high temperature cured polyester coating per manufacturer's standard for phenolic photopolymer material.
- G. Panel size: As indicated on drawings.
- H. Panel colors: To be selected by Architect from manufacturer's standard.
- I. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- J. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- K. Text or graphic schedule: To be determined by Owner as part of submittal review process.
- L. Linear Accents: Provide manufacturer's standard linear accents as follows:
  - 1. Type A-Square. Material: Aluminum alloy. Finish: High Temperature Cured Polyester Coating.
- M. Accessories: Provide manufacturer's standard accessories as follows:
  - 1. WindowSign<sup>™</sup>. Material: Extruded aluminum and painted.
  - 2. Graphic technique: Print on Panel (POP).
  - 3. Minimum 144 sq. in size, manufacturer's standard approved by Architect, graphic layout indicating major building elements, corridors, exits, fire protection devices, routes of travel and required emergency information, in minimum 3 colors, tactile where required.
  - 4. Conform to Section 3.09, Title 19, CCR.
- N. Linear Accents: Provide manufacturer's standard linear accents as follows:
- O. Type A-Square. To be selected by Architect from manufacturer's standard.
- P. Mounting: Wall Mounted with bond, closed cell tape.
  - 1. Locations: Locate at each stair and elevator landing and immediately inside all public entrances. Refer to drawings for locations.

#### 2.08 ACCESSIBILITY EXIT/EXIT ROUTE SIGNAGE

- A. Interior Applications:
  - 1. ADA-Ready<sup>™</sup> Panels; Infinity Series by ASI.
  - 2. Material: Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's phenolic photopolymer bonded process. Signface of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.
  - 3. Finish: Two-component high temperature cured polyester coating per manufacturer's standard for phenolic photopolymer material.
- B. Exterior Applications:
  - 1. ADA-Ready<sup>™</sup> Panels; SignEtch I Series by ASI.
  - 2. Base Material: Zinc, in 0.125 inch thickness. Photochemically-Etched ADA panels.
  - 3. Paint: Primer and urethane based color coat, of type standard with manufacturer with U.V. resistant clear urethane top coat.
- C. Tactile Graphics and Text:

- 1. Fabrication process: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's photochemical etching.
- D. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
- E. Edge Detail: Square
- F. Edge Finish: Painted.
- G. Panel size: As indicated on drawings.
- H. Panel colors: To be selected by Architect from manufacturer's standard.
- I. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- J. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- K. Type A-Square. To be selected by Architect from manufacturer's standard.
- L. Mounting (interior applications): Wall mounted with bond, closed cell tape.
- M. Mounting (exterior applications): VT, vinyl tape and SA, silicone adhesive.
- N. Locations: Provide at each accessible building entrance. Include International symbol of accessibility with text "This facility entirely accessible by persons with disabilities", manufacturer's standard, approved by Architect. Sign shall be visible to persons along approaching pedestrian ways.
- O. Provide Traffic Control Directional signs at every junction along the Route of Travel with arrow indicators and international sign of accessibility, Section 1117B.5.10.
- P. Conform to Sections 1115.B.5 through 1117B.5, California Building Code.

## 2.09 RESTROOM SIGNS

- A. Restroom Wall Signs:
  - 1. ADA-Ready<sup>™</sup> Panels; Infinity Series by ASI.
  - 2. Material: Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's phenolic photopolymer bonded process. Signface of single material, tactile characters and Braille integral to photopolymer. Provide raised characters and symbols to conform to California Building Code. Adhesive-fixed characters are not acceptable.
  - 3. Finish: Two-component high temperature cured polyester coating per manufacturer's standard for phenolic photopolymer material.
- B. Restroom Door Signs:
  - 1. Panels; SP Series by ASI.
  - 2. Material: Photo-etched polymer panel with subsurface paint and graphics applied to non-glare clear lens.
  - 3. Provide restroom signage on door, and restroom identification sign as shown on drawings.
- C. Panel size: As indicated on drawings.
- D. Panel colors: To be selected by Architect from manufacturer's standard.
- E. Text or graphic colors: To be selected by Architect from manufacturer's standard.
- F. Letter styles, letter sizes and layout position: As indicated on drawings. To be selected by Architect from manufacturer's standard.
- G. Mounting: Wall mounted with bond, closed cell tape.

### 2.10 OCCUPANT LOAD SIGNS

- A. Refer to Restroom Door Sign above for panel materials and finish.
- B. Provide maximum occupancy load signs in locations noted on the Drawings. Conform to Section 1003.2.2 California Building Code.
- C. Panel size: As indicated on drawings.

### 2.11 STAIRWAY LEVEL IDENTIFICATION

- A. Refer to Accessibility Exit/Exit Route Signage above for panel materials and finish.
- B. Mount signs 60 inches above each floor landing immediately adjacent to door on strike side. Conform to Section 1133B.4.3 and 1117B5.2 California Building Code
- C. Panel size: As indicated on drawings.

## 2.12 ELEVATOR EMERGENCY SIGNS AND WHEELCHAIR LIFT

- A. Refer to Accessibility Exit/Exit Route Signage above for panel materials and finish.
- B. Provide approved pictorial sign of standardized design, posted adjacent to each elevator and wheelchair lift call station, except main entrance level. Conform to Section 3003.6 California Building Code.
- C. Sign shall indicate that in case of fire, elevator or wheelchair lift will not operate and exit stairways shall be used.
- D. Panel size: As indicated on drawings.

### 2.13 EMERGENCY GAS-SHUT OFF SIGN

- A. Refer to SignEtch I Series above for panel type and finish.
- B. Locations: Refer to Mechanical drawings.
- C. Size: 6" x 6", text to include: "Emergency Gas-Shut Off Valve."

### 2.14 FIRE SPRINKLER RISER ROOM SIGN

- A. Refer to Restroom Door Sign above for panel materials and finish.
- B. Locate one sign at each fire sprinkler riser room door as indicated in drawings.
- C. Text: Sign to read "Fire Sprinkler Riser Room", white color letters, 1 inch high on red background.

### 2.15 MISCELLANEOUS SIGNS

A. For all other signs indicated on drawings, provide materials and finish per the Accessibility Exit/Exit Route Signage section above with ADA Panel, Infinity Series for interior applications, and Sign Etch I Series for exterior applications.

### 2.16 EXTERIOR DIRECTIONAL SIGNAGE

- A. Basis-of-Design: Compass Series Double Posts and Panel by ASI, Inc. or equal. Exterior aluminum sign with interchangeable components.
  - 1. Double Post and Panel Signs:
  - 2. Panel size:(1) 12"(h) x 18"(w) panel, and (2) 4-3/4"(h) x 18"(w) panels

- 3. Panel type: Regular panel, 1" (25 mm) wide.
- 4. Panel Attachment Type: Top loading panels.
- 5. Posts:
  - a. (1) Round Post: 3-1/2" (90 mm) diameter x 60"(h), one channel post.
  - b. (1) Triangular Post: 6-7/8" (175 mm) face width post x 60"(h).
- 6. Mounting: Manufacturer's standard galvanized steel ground sleeve in 24" diameter x 36" deep concrete footing for posts. Concrete strength shall be a minimum 2,500psi.
- B. Materials and Components:
  - 1. Aluminum Panels: Meeting ASTM B209, alloy EN 5052 H12, minimum 0.05" (1.25mm) thick.
  - 2. Aluminum Extrusions: Meeting ASTM B221, alloy 6063-T5.
  - 3. Accessories: Provide end caps, couplings, coupling fittings, mounting fittings, interchangeable fittings, and other hardware and accessories for a complete installation.
  - 4. Finish: Manufacturer's standard two-phase, high temperature cured polyester color coating as follows:
  - 5. Primer: 2 mil thick chromium layer for optimum surface coat adhesion and weatherability.
  - 6. Top Coat: Two-component, water-based, non-toxic, lead-free, zero emissions, high temperature cured polyester coating of 2-3 mil thickness.
  - 7. Colors: To be selected by Architect from manufacturer's standard.
  - 8. Text/Graphics Color: Refer to Drawings.
  - 9. Font: To be selected by Architect from manufacturer's standard.
- C. Tamper Resistance: System shall a concealed locking method to increase level of tamper resistance.
- D. Mounting: Signs must be able to accommodate installation via fully concealed mechanical fasteners.
- 2.17 DUAL PLUMBED RECLAIMED WATER SIGNAGE
  - A. Provide signage per requirement for Irvine Ranch Water Dsitrict (IRWD) requirements.
  - B. Products of the following manufacturer form the basis for design and quality intended:
    - 1. APCO Signs; Full View Series
  - C. Material: laminated plastic
    - 1. Upper layer: Non-glare, clear acrylic, 1/8" thick.
    - 2. Lower layer: Opaque acrylic, 1/8" thick.
    - 3. Polished edges.
    - 4. Color selected by Architect.
    - 5. Location and Size: As indicated on drawings.
  - D. Material: aluminum
    - 1. Color: Per IRWD standards
    - 2. Location and Size: As indicated on drawings.

- E. Material: vinyl
  - 1. Color: Per IRWD standards
  - 2. Location and Size: As indicated on drawings.
- F. Provide vinyl with adhesive on backside in order to attach to inside of access panel door as indicated on Drawings.

### 2.18 DIMENSIONAL CHARACTERS

- A. Basis-of-Design: Series LPS Dimensional Cut Letters by ASI, Inc. or equal.
- B. Building Name: Comply with requirements indicated for finish, style, and size:
  - 1. Material: Aluminum, Clear Anodized.
  - 2. Character Thickness: 1 inch.
  - Character Height: 12 inch high. Letters shall read "ADVANCED TECHNOLOGY & EDUCATION PARK".
  - 4. Character Style: Deep Ribbon.
  - 5. Location: To be determined owner.
    - a. Mounting: Projected mechanical attachment to substrate. Field verify mounting substrate prior to fabrication
- C. Adjacent to Interior Directory: Comply with requirements indicated for finish, style, and size:
  - 1. Material: Aluminum, Clear Anodized.
  - 2. Character Thickness: As shown on drawings.
  - 3. Character Height: As shown on drawings.Letters shall read "DIRECTORY".
  - 4. Character Style: Deep Ribbon.
  - 5. Location: As shown on drawings.
    - a. Mounting: Projected mechanical attachment to substrate. Field verify mounting substrate prior to fabrication

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify fonts, texts for each signs with Architect.
- B. Verify that surfaces are ready to receive work.
- C. Beginning of installation means installer accepts existing surfaces.

### 3.02 METHODS OF INSTALLATION

- A. Interior Identification Signs and Interior Directional Signs:
  - 1. Fasten sign to wall with very high-bond double-faced tape.
  - 2. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.
    - a. Exterior Wall Mounted Identification Signs :

- 1) Install to wall with 4 tampered-proof counter-sunk fasteners; one at each corners of sign.
- b. Exterior Building Sign:
  - 1) Each letter shall be furnished with a minimum of 3 cast mounting lugs on backside, drilled and tapped to receive installation bolts.
  - 2) Letters shall be installed according to manufacturer's method PMC-1. Letters shall be installed 3/4 inch away from wall surface, by an aluminum sleeve spacer.

## 3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.
- B. PROTECTION
  - 1. Protect Work of this section until Substantial Completion.

END OF SECTION

## SECTION 102116.14 – STAINLESS-STEEL TOILET COMPARTMENTS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Stainless steel compartments.
- B. Related Requirements:
  - 1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to the overhead structural system.
  - 2. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
  - 3. Section 102800 "Toilet, Bath, and Laundry Accessories" for grab bars, purse shelves, and similar accessories.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For dressing compartments.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted accessories.
  - 3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
  - 4. Show locations of centerlines of drains.
  - 5. Show support or bracing locations.
- C. Samples for Initial Selection: For each type of compartment material indicated.
  - 1. Include Samples of hardware and accessories for material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for compartments, prepared on 6-inch-(152-mm-) square Samples of same thickness and material indicated for the Work.
  - 2. Each type of hardware and accessory.
  - 3. Curtain Fabric: 12-inch- (305-mm-) square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.

### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower and dressing compartments to include in maintenance manuals.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hinges: One door hinge with associated fasteners.
  - 2. Latch and Keeper: One latch and keeper with associated fasteners.
  - 3. Clothing Hook: One clothing hook with associated fasteners.
  - 4. Door Bumper: One door bumper with associated fasteners.
  - 5. Door Pull: One door pull with associated fasteners.
  - 6. Fasteners: 10 fasteners of each size and type.

## 1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of fixtures, drains, walls, columns, ceilings, and other construction contiguous with shower and dressing compartments by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.

### 2.2 STAINLESS STEEL COMPARTMENTS (TC-01)

- A. Basis of Design: Bradley, www.bradleycorp.com, Phone: (800) 272-3539 or equal
  - 1. Floor Mounted Overhead -Braced Restroom Partitions
  - 2. Stainless Steel Sentinel, Series 400
- B. Configuration: As indicated on Drawings.
- C. Enclosure Style: Overhead braced.
- D. Panel and Pilaster Construction: Seamless stainless steel facing sheets, pressure laminated to core material, with continuous, interlocking molding strip or lapped-and-formed edge closures and with corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
  - 1. Core Material: Manufacturer's standard, sound-deadening honeycomb of resinimpregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for panels and 1-1/4 inches (32 mm) for pilasters.

- 2. Grab-Bar and Seat Reinforcement: Concealed internal reinforcement for grab bars and seats mounted on compartments of size and material adequate for panel to withstand required grab-bar or seat loading without deformation of panel.
- 3. Tapping Reinforcement: Concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to compartments.
- E. Door Construction: Match panels; 1-inch (25-mm) finished thickness.
- F. Facing Sheets and Edge Closures: Stainless steel sheet of nominal thicknesses as follows:
  - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch (0.95 mm).
  - 2. Panels: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
  - 3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
- G. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.
- H. Stainless Steel Finish: Manufacturer's standard textured finish as selected on exposed faces. Protect exposed surfaces from damage by applying strippable, temporary protective covering before shipment.

## 2.3 MATERIALS

- A. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless Steel Castings: ASTM A743/A743M.

## 2.4 ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's standard design, heavy-duty, operating hardware and accessories.
  - 1. Material: Stainless steel.
  - 2. Hinges: Manufacturer's standard, allowing emergency access by lifting door.
  - 3. Latch and Keeper: Manufacturer's standard, latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility.
  - 4. Door Bumper: Manufacturer's standard, rubber-tipped bumper at outswinging doors.
  - 5. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

### 2.5 FABRICATION

A. Floor-and-Ceiling-Anchored Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Door Sizes and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, inswinging doors for standard shower and dressing compartments, and 36-inch- (914-mm-) wide, outswinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.
- B. Floor-and-Ceiling-Anchored Compartments: Secure pilasters to supporting construction, and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

#### 3.2 ADJUSTING

- A. Curtain Adjustment: After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.
- B. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102116.14

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Warm-air dryers.
  - 3. Underlavatory guards.
  - 4. Custodial accessories.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full size, for each exposed product and for each finish specified.

## 1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

### 1.5 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

### PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. California Building Code:
  - 1. Elements of sanitary facilities shall be mounted at location in compliance with CBC Sections 11B-602 through 11B-612

Toilet and Bath Accessories 10 28 00 - 1 2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or

be as follows:

- a. 1-1/2 inch between the grab bar and wall.
- b. 1-1/2 inch minimum between the grab bar and projecting objects below and at the ends.
- c. 12 inch minimum between the grab bar and projecting objects above.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers:
  - 1. Bobrick (Basis-of-Design)
  - 2. Approved Equal
- B. General: Provide heavy duty, 22 gauge, type 304 stainless steel accessories with satin finish (no. 4).
- C. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- A. Toilet Tissue (Roll) Dispenser:
  - 1. Basis-of-Design:
    - a. Bobrick B-2888 (surface mounted)
    - b. Bobrick B-3888 (Recessed at accessible toilets)
  - 2. Double roll, stainless steel unit with tumbler lock.
  - 3. Provide toilet tissue dispenser with continuous flow at accessible toilets.
- B. Combination Towel (Folded) Dispenser/Waste Receptacle:
  - 1. Basis-of-Design: Bobrick B-3944.
  - 2. Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
- C. Toilet Seat Cover Dispenser:
  - 1. Basis-of-Design: Bobrick B221
  - 2. Satin-finish stainless steel. Dispense 250 single- or half-fold toilet seat covers or one box.
- D. Liquid-Soap Dispenser:
  - 1. Basis-of-Design: Bobrick B-2111.
  - 2. Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window

Toilet and Bath Accessories 10 28 00 - 2 gage refill indicator, tumbler lock.

- E. Grab Bar: Stainless steel, nonslip grasping surface finish.
  - 2. Standard Duty Grab Bars:
    - a. Push/Pull Point Load: 250 pound-force, minimum.
    - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
    - c. Length and Configuration: As indicated on drawings.
- F. Sanitary-Napkin Disposal Unit:
  - 1. Basis-of-Design: Bobrick B-254
  - 2. Stainless steel, surface-mounted or recessed as indicated, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
- G. Mirror Unit:
  - 1. Basis-of-Design: Bobrick B-165 series.
  - 2. One-piece roll-formed, type 304 stainless steel angle framed mirror with continuous stiffener on all sides. No. 1 quality, <sup>1</sup>/<sub>4</sub> inch select float glass mirror with type 430 stainless steel channel frame with bright polished finish.
  - 3. Size: As indicated on Drawings.

## 2.3 WARM-AIR DRYERS

- A. Warm-Air Dryer:
  - 1. Basis-of-Design: Excel Dryer Model XL-SB
  - 2. Description: Standard-speed, vandal resistant, ADA compliant warm-air hand dryer.
  - 3. Mounting: Semi-recessed. Provide manufacturer's standard stainless steel recess kit.
  - 4. Operation: Electronic-sensor activated with timed power cut-off switch.
  - 5. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
  - 6. Electrical Requirements: 11.3-12.2 amps, 1240-1450 Watts at 120 Vac Nominal.

### 2.4 UNDERLAVATORY GUARDS

- A. Under lavatory Guard:
  - 1. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
  - 2. Material and Finish: Antimicrobial, molded plastic, white.

## 2.5 CUSTODIAL ACCESSORIES

A. Utility Shelf:

- 1. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
- 2. Size: 16 inches long by 6 inches deep.
- 3. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).
- 1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
- 2. Length: 36 inches.
- 3. Hooks: Four.
- 4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
- 5. Material and Finish: Stainless steel, No. 4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
  - b. Rod: Approximately 1/4-inch- diameter stainless steel.

### 2.6 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION 102800

# SECTION 104413 - FIRE PROTECTION CABINETS

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-protection cabinets for the following:
    - a. Portable fire extinguisher (FEC).
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Show door hardware, cabinet type, trim style, and panel style. Include roughingin dimensions and details showing recessed-, semirecessed-, or surfacemounting method and relationships of box and trim to surrounding construction.
  - 2. Show location of knockouts for hose valves.
- B. Shop Drawings: For fire-protection cabinets.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

## 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

## 1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers, fire hoses, hose valves, and hose racks indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

## 1.6 WARRANTY

A. Materials and Workmanship: Six (6) years from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

# 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
- B. Comply with NFPA and local Fire Marshall's requirements.
- C. Fire Extinguisher Cabinets must comply with CBC Sections 11B-305, 11B-307, 11B-308, and 11B-309.

## 2.3 FIRE-PROTECTION CABINET (FEC-01 & FEC-02)

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Babcock-Davis.
    - b. Fire-End & Croker Corporation.
    - c. Guardian Fire Equipment, Inc.
    - d. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - e. Larsens Manufacturing Company.
    - f. Nystrom.
    - g. Potter Roemer LLC; a Division of Morris Group International.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
  - 1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
- E. Door Material: Steel sheet.
- F. Door Style: Flush opaque panel, frameless, with no exposed hinges.

- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting door pull and friction latch.
  - 2. Provide concealed hinge, permitting door to open 180 degrees.
- H. Accessories:
  - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Black.
      - 4) Orientation: Vertical.
- I. Materials:
  - 1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
    - a. Finish: Factory primed for field painting.
    - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - c. Color: Paint to match adjacent surface, unless otherwise directed by Architect.

# 2.4 FIRE-PROTECTION CABINET (FDVC)

- A. Cabinet Type: Suitable for fire-hose valve.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Babcock-Davis.
    - b. Fire-End & Croker Corporation.
    - c. Guardian Fire Equipment, Inc.
    - d. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - e. Larsens Manufacturing Company.
    - f. Nystrom.
    - g. Potter Roemer LLC; a Division of Morris Group International.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Recessed Cabinet:
  - 1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
- E. Door Material: Steel sheet.
- F. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

- 1. Provide projecting door pull and friction latch.
- 2. Provide concealed hinge, permitting door to open 180 degrees.
- H. Accessories:
  - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
    - a. Identify fire-protection cabinet with the words "FIRE DEPARTMENT VALVE."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Black.
      - 4) Orientation: Vertical.
- I. Materials:
  - 1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
    - a. Finish: Factory primed for field painting.
    - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine roughing-in for hose valves, racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

## 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

- C. Identification:
  - 1. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

# 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

# SECTION 104416 - FIRE EXTINGUISHERS

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:1. Section 104413 "Fire Protection Cabinets."

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.
- 1.5 CLOSEOUT SUBMITTALS
  - A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

## 1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

# 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
    - b. Faulty operation of valves or release levers.
  - 2. Warranty Period: Six years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

## 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Babcock-Davis.
    - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - c. Larsens Manufacturing Company.
    - d. Nystrom.
    - e. Potter Roemer LLC; a Division of Morris Group International.
  - 2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
  - 3. Valves: Nickel-plated, polished-brass body.
  - 4. Handles and Levers: Stainless steel.
  - 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

## 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
  - 1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
  - 1. Mounting Brackets: Top of fire extinguisher to be at 42 inches (1067 mm) above finished floor.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

# SECTION 135200 - SEISMIC REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Seismic requirements for the design and installation of nonstructural components that are permanently attached to structures and for their supports and attachments. Unless otherwise noted, all items shall be designed in accordance with the seismic provisions of the 2019 California Building Code (CBC).
- B. The intent of this Section is to execute an extensive quality assurance program that verifies proper installation of all non-structural components.
- C. Non-structural interior and exterior components of the facility including but not limited to the following:
  - 1. Mechanical equipment and anchorage.
  - 2. Mechanical duct support.
  - 3. Electrical equipment and anchorage.
  - 4. Light fixtures.
  - 5. Electrical and telecommunication conduit and cable tray raceway support.
  - 6. Plumbing and Process Pipe Support.
  - 7. Fire Sprinkler Line Pipe Support.
  - 8. Window System, including curtain wall and storefront.
  - 9. Telecommunications, Audio, Video, and Security Equipment.
  - 10. Interior partitions and hard framed ceiling and soffits.
  - 11. Suspended ceilings supports and ceiling mounted equipment.
  - 12. Wall mounted equipment including casework and toilet accessories.
  - 13. Wall mounted security equipment.
  - 14. Components listed in ASCE 7-16, Chapter 13.
  - 15. Signage.
- D. Non-structural component attachments to the structure shall resist induced seismic forces by positive means. Component attachments shall be bolted, welded or otherwise positively fastened without consideration of friction or resistance produced by the effects of gravity. A continuous load path of sufficient strength and stiffness between the component and supporting structure shall be provided.
- E. Non-structural components not attached to the structure by positive means, shall be isolated using a system adequately designed and tested for a site-specific earthquake.

## 1.2 RELATED SECTIONS

A. Divisions 03 through 33 Sections for seismic requirements specific to the Work of each of those Sections.

### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASCE/SEI 7 Minimum Design Loads for Buildings and Other Structures.
  - 2. 2019 California Building Code (CBC).

### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Include erection drawings, elevations and details where applicable.
- C. Seismic restraint calculations shall be prepared for all systems and equipment covered by this Section.
- D. The submittal shall be prepared and stamped by a Civil Engineer or Structural Engineer licensed in the State of California.
- E. The following information shall be included for each individual component or system:
  - Calculations showing demand lateral loads, support loads, and restraint loads per ASCE 7, Section 13.3, Article 13.3.1. These calculations shall clearly indicate parameters needed to determine demand lateral loads including: ap, Rp, z/h, weight, importance factor, location of center of mass. These calculations shall also clearly indicate location of the equipment being anchored within the facility.
  - 2. Calculations showing design of restraint and support anchorage per ASCE 7, Section 13.4 "Non-structural Component Anchorage."
  - 3. Application of a pre-calculated seismic restraint system applicable for required loads and carrying the approval of ICC.
  - 4. Application of a pre-calculated seismic restraint detail for the applicable loads provided by the equipment manufacturer and carrying the approval of ICC.
  - 5. Anchors to concrete shall be specified in detail, including any testing requirements, and shall have ICC approval for the specific application.
  - 6. Drawings showing equipment dimensions, thickness of sheet metal bases and proper anchorage locations
  - 7. Vibration Isolation Devices: Manufacturer's product information indicating class and type. Indicate load ratings as published in manufacturer's data or shop drawings. Indicate proper orientation of devices on plan. Vibration isolator devices shall be OSHPD approved products.
  - 8. Layouts of seismic restraints for piping and ductwork or specific instructions for determination of layout and appropriate bracing detail in the field.
- F. The submittal shall be reviewed for general conformance with requirements and use of applicable criteria by Architect and Contractor.

### 1.5 QUALITY ASSURANCE

- A. Testing, inspection and observations shall be performed in accordance with CBC Chapter 17A.
- B. Qualifications for Manufacturer and Installer
  - 1. Manufacturer: Company specializing in the design and manufacturing of seismic restraints specified in this Section, with documented experience of more than five years.
  - 2. Installer: Company specializing in executing the scope of work specified in this Section with documented experience of more than five years.
- C. Quality Standards for Installation
  - 1. Contractor's responsibility for the seismic resisting component including a written statement of responsibility to the building official and Owner prior to the commencement of work on the system or component per CBC Section 1704A.4.
  - 2. Quality assurance testing required as a condition of product approvals (e.g., concrete anchors) shall be carried out and paid for by Contractor.
  - 3. Upon completion of seismic restraint installation, Contractor shall indicate that, to the best of their knowledge, the seismic anchorage was installed according to the approved submittal and any approved revisions thereto. This report shall also identify changes made from the approved submittal. Reports may be submitted by system, or by similar groups or components, or for the entire installation covered by this Section.
- D. Special Inspector, Architect and Owner shall observe the attachments and ensure that they are provided in general conformance with the design documents. Do not allow or cause any of the work to be covered or enclosed until the work has been inspected by Special Inspector, and observed by Architect and Owner.
- E. Special Inspection
  - 1. Special inspection shall be performed for the installation of all non-structural components as identified in CBC Section 1705A.12.
  - Owner shall employ one or more Special Inspectors to provide inspections during construction on the types of work listed under CBC Section 1704A.2 including, but not limited to, the installation of the access floor, architectural components, and anchorage of equipment.
  - 3. Special Inspectors shall keep a record of inspections. The Special Inspector shall furnish inspection reports to Architect and Owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of Architect and Owner. A final report of inspections documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted periodically at a frequency agreed upon at the start of the work.
- F. Testing
  - 1. Testing shall be required as listed below in addition to that specified in Chapter 17A of the CBC, unless specific testing requirements are provided in other Sections.
    - a. Anchorage: As indicated on Drawings.
- G. Structural Observation: Structural observation shall be required for the following components during construction of the facility and before final approval.

- 1. Mechanical equipment and anchorage.
- 2. Mechanical duct support.
- 3. Electrical equipment and anchorage.
- 4. Electrical and telecommunication conduit and cable tray raceway support.
- 5. Plumbing and Process Pipe Support.
- 6. Fire Sprinkler Line Pipe Support.
- 7. Window System, including curtain wall and storefront.
- 8. Telecommunications, Audio, Video, and Security Equipment.
- 9. Interior partitions and hard framed ceiling and soffits.
- 10. Suspended ceilings supports and ceiling mounted equipment.
- 11. Wall mounted equipment including casework and toilet accessories.
- 12. Wall mounted security equipment.
- 13. Components listed in ASCE 7, Chapter 13.
- 14. Signage.

### 1.6 DESIGN CRITERIA

- A. Earthquake Loads: Except as otherwise specified below, conform to the provisions of the CBC and applicable prescriptive requirements and/or industry standards indicated in this Section.
- B. Building Data: As identified on drawings.
- C. Seismic: Information as identified on structural drawings.
  - 1. The values of the nonstructural component amplification and response modification response factors (ap and Rp) shall be taken from Table 13.5-1 or 13.6-1 of ASCE 7-16.
  - 2. Without exception, anchorage designed to meet the design requirements of this Section shall be provided for all permanent equipment, unless approved by Architect and Owner to the contrary in writing, or allowed to be exempt per the following conditions of ASCE 7 Section 13.1.4:
    - a. Mechanical and electrical components in Seismic Design Categories D, E, and F where the component importance factor, I<sub>p</sub>, is equal to 1.0 and both of the following conditions apply:
      - 1) Flexible connections between the components and associated ductwork, piping and conduit are provided.
      - 2) Components are mounted at 4 feet or less above a floor level and weigh 400 pounds or less.
    - b. Mechanical and electrical components in Seismic Design Categories D, E, and F where the component importance factor, I<sub>p</sub>, is equal to 1.0 and both of the following conditions apply:
      - 1) Flexible connections between the components and associated ductwork, piping, and conduit are provided.
      - 2) The components weigh twenty pounds or less or, for distribution systems, weighing five pounds per foot or less.

- 3. Horizontal loads should be calculated independently on each of the X- and Y-axes, or on the axis that produces the largest loads for the anchorage.
- 4. Friction resulting from gravity loads should not be used to resist seismic forces.
- 5. Seismic analyses shall include the effects of components attached to the equipment.
- 6. Glass in glazed curtain wall and storefronts shall meet the requirements in ASCE 7, Chapter 13, Section 13.5, Article 13.5.4 "Glass."
- 7. Suspended Ceilings: In accordance with ASCE 7, Chapter 13, Section 13.5, Article 13.5.6 "Suspended Ceilings," as applicable to Seismic Design Category D.
- 8. Partitions: In accordance with ASCE 7, Chapter 13, Section 13.5, Article 13.5.8 "Partitions."
- 9. Mechanical and Electrical Components: In accordance with ASCE 7, Chapter 13, Section 13.6 "Mechanical and Electrical Components."
- D. Anchors:
  - Anchors shall have a current ICC report indicating that the anchors are appropriate for resisting seismic loads and shall be designed as required by the ICC report to withstand the required seismic plus gravity loads.
  - 2. Design of anchorage shall meet requirements of ASCE 7, Chapter 13, Section 13.4 "Non-Structural Component Anchorage."
  - 3. Anchor embedment shall not be less than the manufacturer's recommended minimum embedment for the applicable anchor being used.
  - 4. Anchors shall be designed to resist the combined effect of shear and tension stresses.
  - 5. Anchor spacing and edge distance shall conform to applicable CBC and ICC report requirements.
  - 6. Determination of forces in anchors shall include the expected conditions of installation including eccentricities and prying effects.
  - 7. Powder-actuated fastener anchorage shall not be used to resist seismic loads unless accepted by Architect and Owner in writing.
  - 8. Adhesives shall not be used to resist seismic loads unless accepted by Architect and Owner in writing.

### PART 2 PRODUCTS

Not Used.

### PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Examine job site conditions and verify field dimensions.
  - B. Verify structure or substrate is plumb, level, and ready to receive work.

### 3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.

# 3.3 INSTALLATION

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

END OF SECTION

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section covers and applies to all work specified in Division 26 (and 27 & 28).
- B. Work Included: Materials, equipment, fabrication, installation and tests for fully operational and safe systems, including all necessary materials, appurtenances and features whether specified or shown on drawings or not, in conformity with applicable codes and authorities having jurisdiction for the following:
  - 1. Electrical work specified in all sections within Division 26 (and 27 & 28) of these specifications, including, but not limited to:
    - a. Primary underground service ducts from existing medium voltage switchgear to new medium voltage transformers at new buildings to their respective building main switchboards. Low voltage main building feeders from academic building switchboard to the performing arts building main distribution board.
    - b. Equipment for serving agency facilities is existing and is to be utilized in this project. Transformers, medium voltage cable, and utilization equipment will be furnished and installed by the contractor.
    - c. Lighting and power distribution facilities, including main switchboards with metering, transformers, distribution boards, panelboards with feeders, branch circuit wiring, connections to outlets, and wiring devices.
    - d. Lighting fixtures, lamps and drivers.
    - e. Motor and other power-consuming equipment connections from distribution apparatus to equipment.
    - f. Telephone and Data conduit system, including underground service facilities, riser and lateral extension conduits, and facilities required in terminal room in accordance with the requirements of the Telephone Utility.
    - g. Elevator feeders.
    - h. Control, alarm, and interlock wiring for mechanical equipment, where indicated.
    - i. Electrical grounding system.
    - j. Emergency lighting system via power inverters.
    - k. Vibration and seismic controls for electrical systems.
    - I. Life safety system including ADA and CBC requirements.
    - m. Cable tray system.

- n. Low voltage system (PA, CATV, Security, etc.)
- o. Excavation, backfilling and compacting for the Electrical Work.
- p. Adjustment and testing of the Electrical Work.
- q. Examine the drawings and specifications of other Divisions and provide electrical service for all equipment, devices and controls noted therein, unless work specifically is not included.
- r. Lighting control system.
- s. Dimming system.
- t. Uninterruptable power supply (UPS) system.
- u. Underfloor power and telephone/telecom distribution system.

## 1.3 DESCRIPTION OF BID DOCUMENTS

- A. Specifications:
  - 1. Specifications, in general, describe quality and character of materials and equipment.
  - 2. Specifications are of simplified form and include incomplete sentences.
  - 3. Words or phrases such as "The Contractor shall," "shall be," "furnish," provide," "a," "an," "the," and "all" etc. have been omitted for brevity.
- B. Drawings:
  - 1. Electrical layouts are generally diagrammatic and, although size and location of equipment is drawn to scale wherever possible, Contractor shall make use of all data in Contract Documents and verify this information at building site.
  - 2. Locations of items on the drawings may be distorted for purposes of clearness and legibility. Actual locations of architectural and mechanical items are shown on architectural and mechanical drawings.
  - 3. Contractor shall adjust locations of light fixtures in mechanical rooms to compensate for changes in duct routing, to provide reasonably uniform lighting in work areas.
  - 4. Outlets shall be located in accordance with architectural design, and specific locations may be determined by Owner's representative at jobsite prior to installation.
  - 5. Outlets located on architectural plans by dimension shall be held. Additional outlets may be shown on electrical plans and shall be installed as close as practical to the location shown.
  - 6. Manufacturers' drawings and instructions shall be followed in all cases where the makers of devices and equipment furnish directions, where details are not shown on the drawings, or where described in the specifications.
  - 7. Work installed in a manner contrary to that shown in the contract documents shall be removed and reinstalled when so directed by the Architect. Discrepancies and questionable points shall be immediately reported to the Architect for clarification.
  - 8. The Owner and the Architect reserve the right to make reasonable changes in outlet locations in each area prior to roughing-in at no additional cost to the Owner.

C. If any part of specifications or drawings appears unclear or contradictory, apply to Architect for his interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Architect's decision.

# 1.4 JOB CONDITIONS

- A. Examine all drawings and specifications in a manner to be fully cognizant of all work required under this Division.
- B. Adjoining work of other Divisions shall be examined for interferences and conditions affecting this Division.
- C. Examine site related work and surfaces before starting work of any Section.
  - 1. Report to Architect, in writing, conditions which will prevent proper provision of this work.
  - 2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.
  - 3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.
- D. Connections to existing work:
  - 1. Verification of existing: Before submitting bid, become thoroughly familiar with actual existing conditions and of the existing installations to which connections must be made, including any necessary alterations, and existing building engineering practices and requirements. The intent of the work is shown on the drawings and described herein, and no consideration will be granted by reason of lack of familiarity on the part of the contractor with actual physical conditions, requirements, and practices at the site.
  - 2. Install new work and connect to existing work with minimum interference to existing facilities.
  - 3. Temporary shutdowns of existing services: Indicate dates of proposed electrical power shutdowns required to perform the installation. Notify the college a minimum of 14 days prior to each shutdown. All shutdown coordination meeting shall be arranged by the contractor for each shut down.
  - 4. Power shutdowns shall occur between the hours of 12:00 a.m. and 4:00 a.m.
  - 5. Investigate and list all affected loads that will be switched off during a power shutdown.
  - 6. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work. Do not interrupt alarm and emergency systems.
  - 7. Connect new work to existing work in neat and acceptable manner. Restore existing disturbed work to original condition including maintenance of wiring continuity as required.

## 1.5 DEFINITIONS

A. "Provide": To furnish, install and connect complete and ready for safe and regular operation of particular work referred to unless specifically otherwise noted.

- B. "Install": To erect, mount and connect complete with related accessories.
- C. "Furnish" or "Supply": To purchase, procure, acquire and deliver complete with related accessories.
- D. "Work": Labor, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation.
- E. "Wiring": Raceway, fittings, wire, boxes and related items.
- F. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
- G. "Exposed": Not installed underground or "concealed" as defined above.
- H. "Indicated" "Shown" or "Noted": As indicated, shown or noted on drawings or specifications.
- I. "Equal": Equal in quality, workmanship, materials, weight, size, design and efficiency of specified product, conforming with "Manufacturers".
- J. "Reviewed," "Satisfactory," "Accepted," or "Directed": As reviewed, satisfactory, accepted or directed by or to Architect.
- K. "Motor Controllers": Manual or magnetic starters (with or without switches), individual pushbuttons, or hand-off-automatic (HOA) switches controlling the operation of motors.
- L. "Control Devices": Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

# 1.6 UTILITY CONNECTIONS

- A. Finalize electrical service arrangements including verification of locations and details with the Serving Agency.
- B. Verify locations of facilities and details with the Telephone Utility.
  - 1. Final telephone service arrangements will be made by the Owner.
- C. In addition to the requirements shown on the drawings and stated herein, the work shall comply with the following:
  - 1. Construction Standards and Service Requirements of the respective utilities including any supplementary drawings issued by the utilities.
  - 2. Be subjected to inspection approval of these utilities.
- D. Electrical service facilities shall consist of furnishing and installing concrete encased primary conduits, electrical equipment yard appurtenances and secondary service including utility meter in accordance with the arrangement, details, and locations shown on the drawings and described herein and as required by the utility company.

# 1.7 ELECTRICAL SYSTEM CHARACTERISTICS

- A. Service: 480/277 volts, 3 phase, 4 wire with grounded neutral.
- B. LED Lighting: 277 volts.
- C. Motors <sup>1</sup>/<sub>2</sub> horsepower and above: 480 volts, 3 phase.
- D. Fractional horsepower motors less than <sup>1</sup>/<sub>2</sub> horsepower: 120 volts single phase.
- E. General receptacles will be supplied at 120 volts.

# 1.8 MOUNTING HEIGHTS

A. Mounting heights of devices and equipment shown on the architectural drawings shall govern, but in the absence of such indications, the following centerline heights above the finished floor shall be maintained.

Wall switches	3 feet - 6 inches (or as directed by architect).
Wall lights (interior)	7 feet - 0 inches (or as directed by architect).
Pendant or chain hung fixture	10 feet - 0 inches (or as directed by architect).
Convenience receptacles	1 foot - 3 inches except in Toilets and over cabinets or -counters where devices shall be mounted at 4 feet - 0 inches (9 inches above counter).
Fire alarm stations	4 feet - 0 inches.
Telephone and communication outlets	1 foot - 3 inches.
Clock outlets	1 foot - 6 inches below finished ceiling.
Panelboard cabinets	Shall be installed with the top 6 feet - 6 inches above the floor for cabinets more than 2 feet - 6 inches high and 6 feet - 0 inches for cabinets less than 2 feet - 6
	Wall switches Wall lights (interior) Pendant or chain hung fixture Convenience receptacles Fire alarm stations Telephone and communication outlets Clock outlets Panelboard cabinets

inches high.

9. Motor controllers

# 5 feet-0 inches.

# 1.9 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So that connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

# PART 2 - PRODUCTS

## 2.1 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

# PART 3 - EXECUTION

# 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- F. Layout and installation of electrical work shall be coordinated with the overall construction schedule and work schedules of various trades, to prevent delay in completion of the Project.
  - 1. Complete drawings and specifications for the entire project will be available at the Project site.
  - 2. It shall be obligatory to thoroughly check these drawings before organizing the electrical work schedule, or installing material and equipment.
- G. Dimensions and information regarding accurate locations of equipment, and structural limitations and finish shall be coordinated and verified with other Division of Work. Be prepared to promptly furnish dimensions and information regarding electrical Work to other trades and cooperate with them to secure harmony and the best progress of the Project.
- H. The drawings do not show off-sets, bends, and special fittings, or junction or pull boxes necessary to meet job conditions. These items shall be provided as required at no additional cost to the Owner.
- I. Accessibility and Clearance:
  - 1. Electrical equipment, outlets, junction and pull boxes shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear.
  - 2. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functioning of the equipment.
- J. Scaffolds and staging for installation of electrical work shall be provided under the work of this Division.

# 3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

## 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

## 3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping

materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

## 3.5 WEATHERPROOF EQUIPMENT

- A. Electrical devices or equipment located in damp, semi-exposed areas shall be weather-resistant. Enclosure shall comply with NEMA Type 3R requirements.
- B. Surface mounted outlet boxes shall be cast metal with threaded hubs. Pull or junction boxes shall be cast metal with bolted and gasketed covers.
- C. Outlet box covers shall be of a suitable weatherproof type with gaskets, packing glands, weatherproof doors, or other required means to prevent entry of moisture.
- D. Lighting fixtures shall be installed with suitable gasket, and UL labeled for location.

## 3.6 HOUSEKEEPING PADS AND FOUNDATIONS

- A. Concrete work required for housekeeping pads and foundations will be provided by General Construction Work. Comply with the requirement for concrete base specified in Division 03 section.
  - 1. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for anchoring equipment to the concrete base.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Bolt equipment to channel-iron sills embedded in concrete bases. Install sills level and grout flush with floor or base.
  - 6. Refinish damaged or scratched surfaces.
  - 7. Provide 24 inch wide insulating mat in front of operable electrical equipment and in front and rear of free standing ones.
  - 8. Tighten all bolted connections prior to energizing.
  - 9. Provide fuse cabinet with specified number of fuses of each type.
  - 10. Provide special tools as required for routing maintenance and inspection.
- B. Furnish required dimensional drawings and specify locations. Minimum height of housekeeping pads shall be 3 inches and shall extend out 6 inches from the footprint of the equipment.
- C. Furnish anchor bolts and sleeves, and verify accuracy of installation.
- D. Provide for:
  - 1. Switchboards and switchgears.
  - 2. Floor mounted transformers.

- 3. Outdoor light fixture standards.
- 4.
- MDF/IDF Equipment room racks. All other floor mounted equipment. 5.

END OF SECTION 260500
# SECTION 260503 – DEMOLITION OF ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Demolition and removal of selected portion of electrical systems, including special systems normally specified in Division 27 and 28.
  - 2. Salvage of existing items to be reused.
  - 3. Salvage of existing items to be delivered to the Owner.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed, and salvaged, or removed and reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Remove and salvage items noted as 'salvage', 'return to Owner' or similar manner on the Drawings.
- C. Remove and salvage items as requested by the Owner. Conduct a meeting with the Owner prior to commencing demolition to determine items that the Owner wishes to retain.

#### 1.5 PRE-TESTING

- A. Prior to commencing work, perform testing of devices and systems to verify devices and systems to remain are in good working condition. Devices shall include wiring devices and lighting control devices. Systems shall include, but is not limited to, fire alarm, intercom, clocks, sound reinforcement systems, and security systems.
- B. Prepare a type written report documenting any items found to be damaged or in a nonworking condition. Submit report to the Owner and Architect prior to commencing work. All devices and systems shall be considered in good working conditions if a report is not submitted and acknowledged by the Owner prior to commencing work.
- C. Arrange a time to perform testing with the Owner with at least two weeks advanced notice.
- D. Provide tests as follows on existing feeders to remain and notify engineer of any abnormalities:
  - 1. Megger testing.
  - 2. Infrared scanning at terminations.
- E. Provide tests as follows on existing branch panels, switchboards, switchgear, motor control centers, and other electrical distribution equipment:
  - 1. Infrared scanning.
  - 2. Grounding/bonding continuity.
  - 3. [list other testing]
- F. Existing Branch Circuits that Remain: Trace and ring-out existing branch circuits. Update panel schedules and relabel outlets, disconnect switches, boxes, and the like with actual branch circuit designations. Include such information in record drawings.
- G. Where infrared scanning results indicate excessive heat, tighten the mechanical lugs and retest after 24 hours.
- H. Include testing reports for above in closeout documentation. Record measurements and actions taken.
- PART 2 PRODUCTS (Not Applicable)
- PART 3 EXECUTION

#### 3.1 ELECTRICAL SYSTEMS DEMOLITION

A. Remove items depicted or denoted for demolition on the Drawings. Unless noted otherwise, removal of the items shall include devices, boxes, cable, supporting elements, raceway, etc. associated with the item back to the panelboard or nearest j-box or device to remain.

- B. Drawings are intended to indicate the general scope of demolition work. Visit the Project site to verify existing conditions prior to bidding. Determine means and methods for performing work. Identify existing building finishes, ceiling types, access, and fire walls. Determine locations, routings, and distances as necessary. Coordinate with the Owner to gain access to the facility.
  - 1. Wherever walls, ceilings, structures, or electric-powered equipment are indicated as being removed on the Drawings (including architectural demolition plans and mechanical demolition plans) remove associated electrical system components, equipment, devices, fixtures, raceways, and wiring. Remove, relocate, and extend existing installations, as necessary, to accommodate demolition work, new work, and to maintain the existing electrical installations that shall remain operational. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.
  - 2. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
  - 3. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories
- C. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to loads that remain in operation (i.e., facilities, luminaires, wiring devices, equipment, etc.). Extension of conduit and wire to equipment shall be compatible with the surrounding area.
  - 1. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel and/or junction boxes where appropriate.
  - 2. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
- D. Where existing conduits and/or cables, which remain in service, pass through areas to be renovated and where such conduits and/or cables interfere with new work, reroute these conduits and/or cables to avoid new construction. Provide necessary boxes, cables, splicing and fittings for the rerouting of the circuits. Field-verify to determine complete scope of work prior to bidding.
- E. Existing conduit may remain if all the following are true:
  - 1. Conduit will be reused to feed items installed under this contract.
  - 2. Conduit does not interfere with other trades.
  - 3. Conduit was originally installed meeting specifications related to this project.
  - 4. Conduit will not be exposed in a finished area (unless noted otherwise).
- F. Provide plugs on boxes to remain where conduits have been removed.
- G. Conduits concealed in masonry walls or under concrete slabs may be cut back, sealed, and abandoned.

- H. Provide blank cover-plates on all abandoned boxes to remain in existing masonry or stud walls. Plate color and material shall match wiring devices plates specified for the project. In the absence of such specification, match the color and material of existing wiring devices in the area.
- Maintain power to end-of-line or downstream devices to remain. Provide raceways, boxes, conductors and all other necessary materials as required to re-establish damaged or interrupted feeders and branch circuits. Intercept existing feeders or branch circuits at nearest accessible space or device and reconnect to original feeder or branch circuit source.
- J. Repair or replace ceilings, ceiling tiles, and ceiling-grids that are damaged by this contractor.
- K. Electrical installations that remain shall be concealed, unless otherwise indicated or unless located within unfinished utility-type spaces. Cut and patch existing walls and ceilings as required. Exposed conduits and raceways will be rejected, unless prior approval has been obtained. Confirm scope of work and specific requirements for all such work directly with the Owner and the Architect.
- L. Prior to drilling existing precast concrete walls, detect and locate existing structural members imbedded within the precast panels to ensure they are not damaged.

# 3.2 SPECIAL SYSTEMS DEMOLITION

A. Remove items depicted or denoted for demolition on the Drawings. Unless noted otherwise, removal of the items shall include devices, boxes, cable, supporting elements, etc. associated with the item back to the control panel, terminal block, punch block, patch panel, or similar type of termination point.

#### 3.3 REMOVED MATERIALS

- A. Existing wiring and transformers removed shall be regarded as scrap materials to be recycled by this contractor. Scrap value shall be determined by the contractor and accounted for in the contractor's bid.
  - 1. All other demolished electrical items (e.g., power panels, transformers, luminaires, receptacles, switches, controllers, system devices, etc.) shall be regarded as the Owner's property. The Owner reserves the right to identify which items shall be salvaged—and, thus, carefully removed by this contractor and placed in storage on site as directed by the Owner. The contractor shall be responsible for the proper disposal of all demolished materials that the Owner does not want to salvage. Coordinate specific requirements directly with Owner.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
  - 1. Ballasts in luminaires installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide to Owner and architect/engineer with a Certificate of Destruction to verify proper disposal.
  - 2. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in a permitted hazardous waste disposal facility or by a permitted lamp recycler.

END OF SECTION 260503

PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
  - 1. Section 271313 "Communications Copper Backbone Cabling" for twisted pair cabling used for data circuits.
  - 2. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

### 1.3 DEFINITIONS

- A. PV: Photovoltaic.
- B. RoHS: Restriction of Hazardous Substances.
- C. VFC: Variable-frequency controller.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

# 1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Insulated Wire Corp: a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Southwire Company.
  - 4. Senator Wire & Cable Company
- C. Standards:
  - 1. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Single Conductor Copper: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B496 for stranded conductors.
  - 1. Provide conductors with type THHN/THWN, 90°C insulation for indoor applications.
  - 2. Provide conductors with type THWN-2 or XHHW-2, 90°C insulation for exterior, wet, or damp locations.
  - 3. Provide conductors with Type RHWN-2, 90°C insulation for areas subjected to temperatures exceeding 60°C (140°F)
  - 4. Comply with NEMA WC70.
  - 5. Aluminum and MC cables/conductors are not permitted.
- E. Shield:
  - 1. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.

# 2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and use.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. 3M Electrical Products.
  - 2. AFC Cable Systems; a part of Atkore International.
  - 3. Thomas & Betts Corporation; A Member of the ABB Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One or Two hole with standard barrels.
  - 3. Termination: Compression.

# PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
- D. AC and MC cables not permitted except as specifically noted in this section.
- E. A separate grounding conductor, other than the raceway, shall be included in all feeders and branch circuits.

# 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

- E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. VFC Output Circuits: Type XHHW-2 in metal conduit.
- J. Manufactured wiring systems are not acceptable except within modular partition systems.

# 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

#### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

- 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

#### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

#### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

# 3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

#### 3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:
  - 3. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
      - 3) Thermographic survey.

- c. Inspect compression-applied connectors for correct cable match and indentation.
- d. Inspect for correct identification.
- e. Inspect cable jacket and condition.
- f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
- g. Continuity test on each conductor and cable.
- h. Uniform resistance of parallel conductors.
- 4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
  - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

# SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
  - 1. Underground distribution grounding.
  - 2. Ground bonding common with lightning protection system.
  - 3. Foundation steel electrodes.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Grounding arrangements and connections for separately derived systems.
- B. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
      - 1) Test wells.

- 2) Ground rods.
- 3) Grounding arrangements and connections for separately derived systems.
- b. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems based on NETA MTS.
  - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
  - 2) Include recommended testing intervals.

# PART 2 - PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

# 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advanced Lightning Technology, Ltd.
  - 2. Burndy; Part of Hubbell Electrical Systems.
  - 3. Thomas & Betts Corporation; A Member of the ABB Group

# 2.3 CONDUCTORS

- A. Insulated Conductors: tinned-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 B3.
  - 2. Stranded Conductors: ASTM B8.
  - 3. Tinned Conductors: ASTM B33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

# 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compressiontype wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and longstud lengths, capable of single and double conductor connections.
- L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- M. Straps: Solid copper, copper lugs. Rated for 600 A.
- N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.
- O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- P. Water Pipe Clamps:
  - 1. Mechanical type, two pieces with zinc-plated bolts.

- a. Material: Die-cast zinc alloy.
- b. Listed for direct burial.
- 2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

# 2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

# PART 3 - EXECUTION

#### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 4/0 AWG minimum.
  - 1. Bury at least 30 inches below grade.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
  - 1. Provide separate insulated conductor within each feeder and branch circuit raceway.
- D. Isolated Grounding Conductors: Green-colored insulation with more than one continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- E. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- F. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

#### 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.
- B. Maximum system grounding resistance: 15 Ohms.
- C. Well pipes shall be 8" deep by 24" long fiberglass with cast iron cover marked "GROUND".

#### 3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

#### 3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 2/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

#### 3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

- B. Install insulated equipment grounding conductors with the following items, in addition to those required by the NFPA:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to ductmounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

# 3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at

closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.

- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. Use exothermic welds for all below-grade connections.
  - 3. For grounding electrode system, install at least three rods spaced at least onerod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
  - 1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to the CEC; use a minimum of 20 feet of bare copper conductor not smaller than No. 3/0 AWG.
  - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
  - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- J. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

# 3.7 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at each location where a maximum groundresistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  - 4. Prepare dimensioned Drawings locating each test well, ground rod and groundrod assembly, and other grounding electrodes. Identify each by letter in

alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and\* include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  - 5. Substations and Pad-Mounted Equipment: 5 ohms.
  - 6. Manhole Grounds: 10 ohms.
  - 7. ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Nonmetallic conduits and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Nonmetal wireways and auxiliary gutters.
  - 5. Surface raceways.
  - 6. Boxes, enclosures, and cabinets.
  - 7. Handholes and boxes for exterior underground cabling.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.

#### 1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.
- C. LFMC: Liquidtight flexible metal conduit.
- D. LFNC: Liquidtight flexible nonmetallic conduit.

# 1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
  - 1. Structural members in paths of conduit groups with common supports.
  - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 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.
  - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

# PART 2 - PRODUCTS

# 2.1 METAL CONDUIT AND FITTINGS

- A. Metal Conduit:
  - 1. Listing and Labeling: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. GRC: Comply with ANSI C80.1 and UL 6.
  - 3. IMC: Comply with ANSI C80.6 and UL 1242
  - 4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
    - a. Comply with NEMA RN 1.
    - b. Coating Thickness: 0.040 inch (1 mm), minimum.
  - 5. EMT: Comply with ANSI C80.3 and UL 797.
- B. Metal Fittings:
  - 1. Comply with NEMA FB 1 and UL 514B.
  - 2. Listing and Labeling: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 3. Fittings, General: Listed and labeled for type of conduit, location, and use.

- 4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and the CEC.
- 5. Fittings for EMT:
  - a. Material: Steel
  - b. Type: Compression.
- 6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- 7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in the CEC, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
- D. Floorboxes
  - 1. Manufactueres: Legrand
    - a. Model: Wiremold 6" Evolution Series Poke-Thru

# 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
  - 1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. RNC: Type EPC-40-PVC, Type EPC-80-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  - 3. LFNC: Comply with UL 1660.
- B. Nonmetallic Fittings:
  - 1. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 2. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
    - a. Fittings for LFNC: Comply with UL 514B.
  - 3. Below Grade Long Radius Elbows:
    - a. Conduits 2 inches to 2.5 inches: use minimum 24-inch radius, GRC Elbow.
    - b. Conduits larger than 2.5 inches: use minimum 36-inch radius GRC or Elbow.
  - 4. Solvents and Adhesives: As recommended by conduit manufacturer.

# 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R unless otherwise indicated, and sized according to the CEC.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.

- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Screw-cover type, Flanged-and-gasketed type unless otherwise indicated.
- D. Finish: Manufacturer's standard enamel finish.

# PART 3 - EXECUTION

- 3.1 RACEWAY APPLICATION
  - A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
    - 1. Exposed Conduit: GRC.
    - 2. Concealed Conduit, Aboveground: EMT.
    - 3. Underground Conduit:
      - a. More than 5' outside foundation wall:
        - 1) RNC, Type EPC-40-PVC PVC coated rigid steel
      - b. Within 5' from foundation wall:
        - 1) Rigid steel conduit wrapped with corrosion protective electrical tape.
        - 2) PVC coated rigid steel conduit.
        - 3) RNC, Type EPC-80-PVC, concrete encased or under slab.
    - 4. Above ground:
      - a. Provide GRC.
      - b. Provide EMT may be used in areas above 10' from finished grade.
    - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
    - 6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
  - B. Indoors: Apply raceway products as specified below unless otherwise indicated:
    - 1. Exposed, Not Subject to Physical Damage: Provide GRC.
    - 2. Exposed, Not Subject to Severe Physical Damage: Provide GRC identified for such use.
    - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
      - a. Loading dock.
      - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      - c. Mechanical rooms.
      - d. Gymnasiums.
    - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
    - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

- 6. Exposed dry locations: Provide GRC. EMT may be used in areas 10' above finished grade or floor.
- 7. Damp or Wet Locations: GRC.
- 8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
- G. Provide sheet metal boxes; provide flush mounting outlet box in finished areas.
- H. Provide pull ropes in all empty conduits per spec section 26 05 43 subsection 3.5(J).

# 3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with the CEC limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not fasten conduits onto the bottom side of a metal deck roof.
- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.
- E. Complete raceway installation before starting conductor installation.
- F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

- G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- H. Make bends in raceway using large-radius preformed ells. Field bending shall be according to the CEC minimum radii requirements. Use only equipment specifically designed for material and size involved.
- I. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inch of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from PVC to GRC before rising above floor.
  - 6. Terminations at floor slabs use floor boxes as recommended by manufacturers.
- L. Stub-Ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- N. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- O. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- Q. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

- R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- S. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- U. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
  - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- V. Install raceway sealing fittings at accessible locations according to the CEC and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to the CEC.
- W. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Conduit extending from interior to exterior of building.
  - 4. Conduit extending into pressurized duct and equipment.
  - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6. Where otherwise required by the CEC.
- X. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- Y. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
  - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

- a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
- b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
- c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
- d. Attics: 135 deg F temperature change.
- 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
- 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Z. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to California Building Code (Section 11B-308.1) requirements. Install boxes with height measured from top of box for high-reach conditions and bottom of box for low-reach conditions unless otherwise indicated.
- BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- CC. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- DD. Locate boxes so that cover or plate will not span different building finishes.
- EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- GG. Set metal floor boxes level and flush with finished floor surface.

- HH. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.3 FIRESTOPPING
  - A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.4 PROTECTION
  - A. Protect coatings, finishes, and cabinets from damage and deterioration.
    - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
    - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

# SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Restraint channel bracings.
  - 2. Restraint cables.
  - 3. Seismic-restraint accessories.
  - 4. Mechanical anchor bolts.
  - 5. Adhesive anchor bolts.
- B. Related Requirements:
  - 1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical components include:
  - 1. Control and monitoring panels.
  - 2. Generators.

- 3. Luminaires.
- 4. Motor control centers.
- 5. Panelboards.
- 6. Photovoltaic system components.
- 7. Substations.
- 8. Switchboards.
- 9. Switchgear.
- 10. Transformers.
- 11. Unit substations.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.
- D. Field quality-control reports.

# 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with the CEC.

#### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Values mentioned on the structural design documents shall supersede the values mentioned on this section, in case of discrepancy.
- B. Wind-Restraint Loading:
  - 1. Basic Wind Speed:120MPH.

- 2. Building Classification Category: III.
- 3. Minimum 10 lb/sq. ft. multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- C. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the IBC: E.
  - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.
    - a. Component Importance Factor: 1.5.
    - b. Component Response Modification Factor: 2.5.
    - c. Component Amplification Factor: 2.5.
  - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second):
  - 4. Design Spectral Response Acceleration at 1.0-Second Period:2.

# 2.2 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
  - 4. Unistrut; Part of Atkore International.
- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

#### 2.3 RESTRAINT CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. CADDY; a brand of nVent.
  - 2. Gripple Inc.
  - 3. Kinetics Noise Control, Inc.
  - 4. Vibration Mountings & Controls, Inc.
- B. Restraint Cables: ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

# 2.4 SEISMIC-RESTRAINT ACCESSORIES

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

- 1. B-line, an Eaton business.
- 2. Kinetics Noise Control, Inc.
- 3. Mason Industries, Inc.
- B. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

# 2.5 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hilti, Inc.
  - 3. Kinetics Noise Control, Inc.
  - 4. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinccoated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

#### 2.6 ADHESIVE ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hilti, Inc.
  - 2. Kinetics Noise Control, Inc.
  - 3. Mason Industries, Inc.
- B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

#### 3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Equipment and Hanger Restraints:
  - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
  - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavyduty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in 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.
  - 5. Set anchors to manufacturer's recommended torque using a torque wrench.
  - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

# 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

#### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
  - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
  - 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
  - 5. Test to 90 percent of rated proof load of device.

- C. Seismic controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

# 3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16
# SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Bands and tubes.
  - 4. Tapes and stencils.
  - 5. Tags.
  - 6. Signs.
  - 7. Cable ties.
  - 8. Paint for identification.
  - 9. Fasteners for labels and signs.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For arc-flash hazard study.

### PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
  - A. Comply with ASME A13.1 and IEEE C2.

- B. Comply with the CEC.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  - 4. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 5. Color for Neutral: White.
  - 6. Color for Equipment Grounds: Green.
  - 7. Colors for Isolated Grounds: Green with two or more yellow stripes.
- C. Raceways and Cables Carrying Circuits at More Than 600 V:

- 1. Black letters on an orange field.
- 2. Adhesive labels and warning tape for underground lines.
- 3. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- E. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
- F. Equipment Identification Labels:
  - 1. Black letters on a white field.
  - 2. Engraved plastic attached with rivets or screwed on.
  - 3. Warning Signs:
    - a. Baked enamel and metal butyrate.
  - 4. Instruction signs:
    - a. Engraved, laminated acrylic or melamine plastic.

### 2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weatherand chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Champion America.
    - c. emedco.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. HellermannTyton.
    - c. Marking Services, Inc.

- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. A'n D Cable Products.
    - c. Brother International Corporation.
  - 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  - 3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weatherand UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Brother International Corporation.
    - c. emedco.
  - 2. Minimum Nominal Size:
    - a. 1-1/2 by 6 inches for raceway and conductors.
    - b. 3-1/2 by 5 inches for equipment.
    - c. As required by authorities having jurisdiction.

### 2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. HellermannTyton.
    - c. Marking Services, Inc.
    - d. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Panduit Corp.
- 2.5 TAPES AND STENCILS
  - A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Carlton Industries, LP.
      - b. Champion America.
      - c. HellermannTyton.
  - B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Brady Corporation.
      - b. Carlton Industries, LP.
      - c. emedco.
      - d. Marking Services, Inc.
  - C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and are 12 inches wide. Stop stripes at legends.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. HellermannTyton.
      - b. LEM Products Inc.
      - c. Marking Services, Inc.
      - d. Seton Identification Products.
  - D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Carlton Industries, LP.
      - b. Seton Identification Products.
  - E. Underground-Line Warning Tape:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Ideal Industries, Inc.
  - c. LEM Products Inc.
- 2. Tape:
  - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- 3. Color and Printing:
  - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
  - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
  - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
- F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

## 2.6 TAGS

- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. emedco.
- B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.

- c. emedco.
- C. Write-on Tags:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. LEM Products Inc.
    - c. Seton Identification Products.
  - 2. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
  - 3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Medium Voltage Raceway Tags
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Tech Products Inc. Fast Tag Miniature Markers.
  - 2. Characteristics:
    - Provide tags with highly raised characters, hot stamped with UV stable foil, nonconductive and non-corroding.
    - b. Tags shall be black lettering on yellow background
    - c. Attach tags to raceways with noncorrosive stainless-steel wire.
    - d. Tags shall be provided at minimum where the cable enters and leaves the manhole.

### 2.7 SIGNS

- A. Baked-Enamel Signs:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. Champion America.
    - c. emedco.
    - d. Marking Services, Inc.
  - 2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
  - 3. 1/4-inch grommets in corners for mounting.
  - 4. Nominal Size: 7 by 10 inches.
- B. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.

- b. Carlton Industries, LP.
- c. emedco.
- d. Marking Services, Inc.
- 2. Engraved legend.
- 3. Thickness:
  - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
  - b. For signs larger than 20 sq. in., 1/8 inch thick.
  - c. Engraved legend with black letters on white face.
  - d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
  - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.8 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. HellermannTyton.
  - 2. Ideal Industries, Inc.
  - 3. Marking Services, Inc.
  - 4. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
  - 3. UL 94 Flame Rating: 94V-0.
  - 4. Temperature Range: Minus 50 to plus 284 deg F.
  - 5. Color: Black.

### 2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J. Vinyl Wraparound Labels:

- 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- M. Self-Adhesive Labels:
  - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
  - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- T. Underground Line Warning Tape:
  - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
  - 2. Limit use of underground-line warning tape to direct-buried cables.
  - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- U. Metal Tags:

- 1. Place in a location with high visibility and accessibility.
- 2. Secure using UV-stabilized cable ties.
- V. Nonmetallic Preprinted Tags:
  - 1. Place in a location with high visibility and accessibility.
  - 2. Secure using plenum-rated cable ties.
- W. Write-on Tags:
  - 1. Place in a location with high visibility and accessibility.
  - 2. Secure using plenum-rated cable ties.
- X. Baked-Enamel Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.
- Y. Metal-Backed Butyrate Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- Z. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- AA. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

# 3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

- C. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER CONCEALED HIGH-VOLTAGE WIRING" with 3-inch-high, black letters on 20-inch centers.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10-foot maximum intervals.
- D. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Vinyl wraparound labels.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.
- H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.
- J. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- K. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

- L. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- M. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:
  - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
  - 2. Wall surfaces directly external to raceways concealed within wall.
  - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- N. Workspace Indication: Apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with the CEC and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- O. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- P. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
  - 1. Apply to exterior of door, cover, or other access.
- Q. Arc Flash Warning Labeling: Self-adhesive labels.
- R. Operating Instruction Signs: Baked-enamel warning signs.
- S. Equipment Identification Labels:
  - 1. Indoor Equipment: Baked-enamel signs .
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchgear.
    - e. Switchboards.
    - f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - g. Substations.
    - h. Enclosed switches.
    - i. Enclosed circuit breakers.
    - j. Push-button stations.
    - k. Contactors.
    - I. Remote-controlled switches, dimmer modules, and control devices.

- m.
- Battery-inverter units. Monitoring and control equipment. n.

END OF SECTION 260553

## SECTION 260923 - LIGHTING CONTROL DEVICES

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Photoelectric switches.
  - 2. Daylight-harvesting switching and dimming controls.
  - 3. Indoor occupancy and vacancy sensors.
  - 4. Switchbox-mounted occupancy sensors.
  - 5. Outdoor motion sensors.
  - 6. Lighting contactors.
  - 7. Emergency shunt relays.
- B. Related Requirements:
  - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wallswitch occupancy sensors, and manual light switches.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Include diagrams for power, signal, and control wiring.

### 1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

- 1. Suspended ceiling components.
- 2. Structural members to which equipment will be attached.
- 3. Items penetrating finished ceiling, including the following:
  - a. Luminaires.
  - b. Air outlets and inlets.
  - c. Speakers.
  - d. Sprinklers.
  - e. Access panels.
  - f. Control modules.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's warranties.
- 1.5 CLOSEOUT SUBMITTALS
  - A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
  - B. Software and Firmware Operational Documentation:
    - 1. Software operating and upgrade manuals.
    - 2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
    - 3. Device address list.
    - 4. Printout of software application and graphic screens.
- 1.6 WARRANTY
  - A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
    - 1. Failures include, but are not limited to, the following:
      - a. Faulty operation of lighting control software.
      - b. Faulty operation of lighting control devices.
    - 2. Warranty Period: Two year(s) from date of Substantial Completion.

# PART 2 - PRODUCTS

- 2.1 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Leviton Manufacturing Co., Inc.

- 2. Lutron Vibe
- B. Description: Solid state, with DPST dry contacts rated for 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.
  - 1. Listed and labeled as defined in the CEC, by a agency NRTL, and marked for intended location and application.
  - 2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
  - 3. Time Delay: Fifteen-second minimum, to prevent false operation.
  - 4. Surge Protection: Metal-oxide varistor.
  - 5. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure from same source and manufacturer as switch.
  - 6. Failure Mode: Luminaire stays ON.

# 2.2 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, LUMINAIRE-MOUNTED

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. Description: Solid state, with DPST dry contacts rated for 1800 VA inductive, to operate connected load, complying with UL 773, and compatible with CFL and LED lamps.
  - 1. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
  - 3. Time Delay: Thirty-second minimum, to prevent false operation.
  - 4. Lightning Arrester: Air-gap type.
  - 5. Mounting: Twist lock complying with ANSI C136.10, with base from same source and manufacturer as switch.
  - 6. Failure Mode: Luminaire stays ON.

## 2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.

- 1. Lighting control set point is based on the following two lighting conditions:
  - a. When no daylight is present (target level).
  - b. When significant daylight is present.
- 2. System programming is done with two hand-held, remote-control tools.
  - a. Initial setup tool.
  - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated power pack mounted on luminaire, to detect changes in indoor lighting levels that are perceived by the eye.
- D. Electrical Components, Devices, and Accessories:
  - 1. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
  - 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.
- E. Power Pack: Digital controller capable of accepting four RJ45 inputs with two output(s) rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A ballast load or LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by the CEC.
  - 1. With integral current monitoring.
  - 2. Compatible with digital addressable lighting interface.
  - 3. Plenum rated.

### 2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. General Requirements for Sensors:
  - 1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
  - 2. Dual technology.
  - 3. Integrated power pack.
  - 4. Hardwired connection to switch.
  - 5. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
  - 6. Operation:

- a. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
- 7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A.
- 8. Power: Line voltage.
- Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by the CEC.
- 10. Mounting:
  - a. Sensor: Suitable for mounting in any position on a standard outlet box.
  - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
  - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
- 11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
- 12. Bypass Switch: Override the "on" function in case of sensor failure.
- 13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Wall or Ceiling mounted; detect occupants in coverage area by their heat and movement.
  - 1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
  - 2. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of1000 square feet when mounted 48 inches above finished floor.
- D. Ultrasonic Type: Wall or Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
  - 1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
  - 2. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
  - 3. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
  - 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted84 inches above finished floor.
- E. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination

of technologies that control on-off functions is selectable in the field by operating controls on unit.

- 1. Sensitivity Adjustment: Separate for each sensing technology.
- 2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
- 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
- 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 square feet when mounted48 inches above finished floor.

## 2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
  - 1. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
  - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
  - 4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or LED load at 277 V, and 800-W incandescent.

### 2.6 OUTDOOR MOTION SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. Description: Solid-state outdoor motion sensors.
  - 1. Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.

- 2. Dual-technology (PIR and ultrasonic) type, weatherproof. Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.. Comply with UL 773A.
- 3. Switch Rating:
  - a. Luminaire-Mounted Sensor: 1000-W incandescent, 500-VA fluorescent/LED.
  - b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by the CEC.
- 4. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
- 5. Voltage: Match the circuit voltage type.
- 6. Detector Coverage:
  - a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
  - b. Long Range: 180-degree field of view and 110-foot detection range.
- 7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
- 8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
- 9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
- 10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" according to UL 773A.

### 2.7 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. Description: Electrically operated and mechanically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.
  - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
  - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
  - 3. Enclosure: Comply with NEMA 250.
  - 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

#### 2.8 EMERGENCY SHUNT RELAY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Manufacturing Co., Inc.
  - 2. Lutron Vibe
- B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
  - 1. Coil Rating: 277 V.
- 2.9 CONDUCTORS AND CABLES
  - A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.
  - B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG.
  - C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

## 3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

### 3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpowerlimited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

## 3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

- 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
  - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
  - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

# 3.8 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

#### 3.9 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems.
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

## SECTION 262416 - PANELBOARDS

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Lighting and Appliance branch-circuit panelboards.
  - 2. Disconnecting and Overcurrent Protective Devices

### 1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

- 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
- 4. Detail bus configuration, current, and voltage ratings.
- 5. Short-circuit current rating of panelboards and overcurrent protective devices.
- 6. Include evidence of NRTL listing for series rating of installed devices.
- 7. Include evidence of NRTL listing for SPD as installed in panelboard.
- 8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- 9. Include wiring diagrams for power, signal, and control wiring.
- 10. Key interlock scheme drawing and sequence of operations.
- 11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

# 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

# 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Keys: Two spares for each type of panelboard cabinet lock.
  - 2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
  - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

### 1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

#### 1.10 FIELD CONDITIONS

- A. Environmental Limitations:
  - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 23 deg F to plus 140 deg F.
    - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect Construction Manager Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Owner's written permission.
  - 3. Comply with NFPA 70E.

#### 1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.
  - 1. SPD Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with the CEC.
- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 2. Height: 84 inches maximum.
  - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
  - 5. Finishes:
    - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
    - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- G. Incoming Mains:
  - 1. Location: Convertible between top and bottom.

- 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
  - 5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- I. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Terminations shall allow use of 75 deg C rated conductors without derating.
  - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  - 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
  - 1. Percentage of Future Space Capacity: 20 percent.
- L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical shortcircuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
  - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. 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."
- B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

### 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. General Electric Company/ABB .
  - 2. Eaton.
  - 3. Schneider Electric USA (Square D).
  - 4. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
  - 1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
  - 2. External Control-Power Source: 120-V branch circuit.

### 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. General Electric Company/ABB.
  - 2. Eaton.
  - 3. Schneider Electric USA (Square D).
  - 4. Siemens Industry, Inc., Energy Management Division.

- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with frontmounted, field-adjustable trip setting.
  - 3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Digital display of settings, trip targets, and indicated metering displays.
    - d. Multi-button keypad to access programmable functions and monitored data.
    - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    - f. Integral test jack for connection to portable test set or laptop computer.
    - g. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
      - 4) Ground-fault pickup level, time delay, and I squared T response.
  - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  - 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  - 6. Subfeed Circuit Breakers: Vertically mounted.
  - 7. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.
    - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    - h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

- i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
- j. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
- k. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
- I. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- m. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
- n. Multipole units enclosed in a factory assembled to operate as a single unit.
- o. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- p. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  - 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
  - 2. Fused Switch Features and Accessories:
    - a. Standard ampere ratings and number of poles.
    - b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.
    - c. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

# 2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
  - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

#### 2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in the CEC.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
  - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
  - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
  - 3. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

- F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- G. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- H. Mount panelboard cabinet plumb and rigid without distortion of box.
- I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- J. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
  - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.
- N. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- P. Mount spare fuse cabinet in accessible location.

## 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- D. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Do not perform optional tests. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    - c. Instruments and Equipment:
      - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

#### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
  - 1. Measure loads during period of normal facility operations.
  - 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
  - 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

### 3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416
## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Standard-grade receptacles, 125 V, 20 A.
  - 2. GFCI receptacles, 125 V, 20 A.
  - 3. Twist-locking receptacles.
  - 4. Cord and plug sets.
  - 5. Toggle switches, 120/277 V, 20 A.
  - 6. Wall plates.
  - 7. Floor service fittings.
  - 8. Poke-through assemblies.
  - 9. Pre-fabricated multioutlet assemblies.
  - 10. Service poles.

### 1.3 DEFINITIONS

- A. AFCI: Arc-fault circuit interrupter.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- 1.4 ACTION SUBMITTALS
  - A. Product Data: For each type of product.

- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- 1.5 INFORMATIONAL SUBMITTALS
  - A. Field quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
  - A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
  - 2. SPD Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

### PART 2 - PRODUCTS

## 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and use.
- B. Comply with the CEC.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with requirements in this Section.
- F. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- G. Device Color:

- 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by the CEC or device listing.
- 2. SPD Devices: Blue.
- H. Wall Plate Color: For plastic covers, match device color.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- 2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A
  - A. Duplex Receptacles, 125 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Description: Two pole, three wire, and self-grounding.
    - 3. Configuration: NEMA WD 6, Configuration 5-20R.
    - 4. Standards: Comply with UL 498 and FS W-C-596.
  - B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
    - 3. Configuration: NEMA WD 6, Configuration 5-20R.
    - 4. Standards: Comply with UL 498 and FS W-C-596.
    - 5. Marking: Listed and labeled as complying with the CEC, "Tamper-Resistant Receptacles" Article.
  - C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.

- d. Pass & Seymour/Legrand (Pass & Seymour).
- 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
- 3. Configuration: NEMA WD 6, Configuration 5-20R.
- 4. Standards: Comply with UL 498.
- 5. Marking: Listed and labeled as complying with the CEC, "Receptacles in Damp or Wet Locations" Article.
- D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
  - 3. Configuration: NEMA WD 6, Configuration 5-20R.
  - 4. Standards: Comply with UL 498.
  - 5. Marking: Listed and labeled as complying with the CEC, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.
- 2.3 GFCI RECEPTACLES, 125 V, 20 A
  - A. Duplex GFCI Receptacles, 125 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
    - 3. Configuration: NEMA WD 6, Configuration 5-20R.
    - 4. Type: Non-feed through.
    - 5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
  - B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Hubbell Incorporated; Wiring Device-Kellems.
- b. Pass & Seymour/Legrand (Pass & Seymour).
- 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
- 3. Configuration: NEMA WD 6, Configuration 5-20R.
- 4. Type: Non-feed through.
- 5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
- 6. Marking: Listed and labeled as complying with the CEC, "Tamper-Resistant Receptacles" Article.
- C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
  - 3. Configuration: NEMA WD 6, Configuration 5-15R.
  - 4. Type: Non-feed through.
  - 5. Standards: Comply with UL 498 and UL 943 Class A.
  - 6. Marking: Listed and labeled as complying with the CEC, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.
- 2.4 TWIST-LOCKING RECEPTACLES
  - A. Twist-Lock, Single Receptacles, 120 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Configuration: NEMA WD 6, Configuration L5-20R.
    - 3. Standards: Comply with UL 498.
  - B. Twist-Lock, Single Receptacles, 250 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Eaton (Arrow Hart).
- b. Hubbell Premise Wiring.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
- 2. Configuration: NEMA WD 6, Configuration L6-20R.
- 3. Standards: Comply with UL 498.
- C. Twist-Lock, Single Receptacles, 277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Premise Wiring.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Configuration: NEMA WD 6, Configuration L7-20R.
  - 3. Standards: Comply with UL 498.
- D. Twist-Lock, Isolated-Ground, Single Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Premise Wiring.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Grounding: Equipment grounding contacts shall be connected only to green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
  - 3. Configuration: NEMA WD 6, Configuration L5-20R.
  - 4. Standards: Comply with UL 498.
- E. Description: Matching, locking-type plug and receptacle body connector, heavy-duty grade.
- F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton (Arrow Hart).
  - 2. Ericson.
  - 3. Hubbell Premise Wiring.
  - 4. Leviton Manufacturing Co., Inc.
  - 5. Pass & Seymour/Legrand (Pass & Seymour).
- G. Configuration: NEMA WD 6, Configurations L5-20P and L5-20R.

- H. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
- I. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.
- J. Standards: Comply with FS W-C-596.
- 2.5 CORD AND PLUG SETS
  - A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.
- 2.6 TOGGLE SWITCHES, 120/277 V, 20 A
  - A. Single-Pole Switches, 120/277 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Standards: Comply with UL 20 and FS W-S-896.
  - B. Two-Pole Switches, 120/277 V, 20 A:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Pass & Seymour/Legrand (Pass & Seymour).
    - 2. Comply with UL 20 and FS W-S-896.
  - C. Three-Way Switches, 120/277 V, 20 A:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- 2. Comply with UL 20 and FS W-S-896.
- D. Four-Way Switches, 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Standards: Comply with UL 20 and FS W-S-896.
- E. Pilot-Light, Single-Pole Switches: 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Illuminated when switch is on.
  - 3. Standards: Comply with UL 20 and FS W-S-896.
- F. Lighted Single-Pole Switches, 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Premise Wiring.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Handle illuminated when switch is on.
  - 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

- G. Key-Operated, Single-Pole Switches, 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Factory-supplied key in lieu of switch handle.
  - 3. Standards: Comply with UL 20 and FS W-S-896.
- H. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: For use with mechanically held lighting contactors.
  - 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- I. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: For use with mechanically held lighting contactors, with factorysupplied key in lieu of switch handle.
  - 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

# 2.7 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.

- 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
- 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
- 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.
- D. Antimicrobial Cover Plates:
  - 1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
  - 2. Tarnish resistant.

# 2.8 FLOOR SERVICE FITTINGS

- A. Flush-Type Floor Service Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Premise Wiring.
    - c. Thomas & Betts Corporation; A Member of the ABB Group.
    - d. Wiremold / Legrand.
  - 2. Description: Type: Modular, flush-type, dual-service units suitable for wiring method used, with cover flush with finished floor.
  - 3. Compartments: Barrier separates power from voice and data communication cabling.
  - 4. Service Plate and Cover: Rectangular, solid brass with satin finish.
  - 5. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
  - 6. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

## 2.9 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Pass & Seymour/Legrand (Pass & Seymour).

- 3. Square D; by Schneider Electric.
- 4. Wiremold / Legrand.
- C. Standards: Comply with scrub water exclusion requirements in UL 514.
- D. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- E. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
- F. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
- G. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
- H. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- 2.10 PREFABRICATED MULTIOUTLET ASSEMBLIES
  - A. Description: Two-piece surface metal raceway, with factory-wired multioutlet harness.
  - B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - 1. Hubbell Incorporated; Wiring Device-Kellems.
    - 2. Wiremold / Legrand.
  - C. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
  - D. Raceway Material: Metal, with manufacturer's standard finish.
  - E. Multioutlet Harness:
    - 1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
    - 2. Receptacle Spacing: 6 inches.
    - 3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.
- 2.11 SERVICE POLES
  - A. Description: Dual-Channel Service Poles "Service pole"

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Wiremold / Legrand.
- C. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
- D. Poles: Nominal 2.5-inch- (65-mm-) square cross-section, with height adequate to extend from floor to at least 6 inches (150 mm) above ceiling, and with separate channels for power wiring and voice and data communication cabling.
- E. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
- F. Material: [Aluminum] <Insert material>.
- G. Finishes: [Manufacturer's standard painted finish and trim combination] [Satin-anodized aluminum].
- H. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, balanced twisted pair data communication cables.
- I. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
- J. Data Communication Outlets: [Blank insert with bushed cable opening.] [Two RJ-45 jacks, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."] [Four RJ-45 jacks, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."]

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

- 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
- 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall comply with the CEC, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  - 8. Tighten unused terminal screws on the device.
  - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
  - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
  - 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
  - 1. Install dimmers within terms of their listing.
  - 2. Verify that dimmers used for fan-speed control are listed for that application.
  - 3. Install unshared neutral conductors on the line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

## 3.2 GFCI RECEPTACLES

A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

### 3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

# 3.4 FIELD QUALITY CONTROL

- A. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
  - 1. In healthcare facilities, prepare reports that comply with NFPA 99.
  - 2. Test Instruments: Use instruments that comply with UL 1436.
  - 3. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

- 5. Using the test plug, verify that the device and its outlet box are securely mounted.
- 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning, units and replace with new ones, and retest as specified above.
- C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.
- D. Wiring device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 262726

# SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Shunt trip switches.
  - 4. Molded-case switches.
  - 5. Enclosures.

### 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

- B. Shop Drawings: For enclosed switches and circuit breakers.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include wiring diagrams for power, signal, and control wiring.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 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.
- C. Field quality-control reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
    - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 2. Fuse Pullers: Two for each size and type.

### 1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise onsite testing.

### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

### 1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: One year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. 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 and the unit will be fully operational after the seismic event."

### 2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by an NRTL, and marked for intended location and application.
- D. Comply with the CEC.

# 2.3 FUSIBLE SWITCHES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. <u>Eaton</u>.
  - 2. General Electric Company/ABB.
  - 3. Schneider Electric USA (Square D).
  - 4. Siemens Industry, Inc., Energy Management Division.
- B. Type HD, Heavy Duty:
  - 1. Single throw.
  - 2. Three pole.
  - 3. 600-V ac.
  - 4. 200 A and smaller.
  - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  - 6. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating 120-V ac.
  - 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 6. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 7. Service-Rated Switches: Labeled for use as service equipment.

### 2.4 NONFUSIBLE SWITCHES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. <u>Eaton</u>.
  - 2. <u>General Electric Company</u>.
  - 3. Square D; by Schneider Electric.
  - 4. Siemens Industry, Inc., Energy Management Division.

- B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating 120-V ac.
  - 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 6. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 7. Service-Rated Switches: Labeled for use as service equipment.

## 2.5 SHUNT TRIP SWITCHES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. <u>Bussmann, an Eaton business</u>.
  - 2. <u>Littelfuse, Inc</u>.
  - 3. <u>Mersen USA</u>.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, pilot, indicating and control devices.
- E. Accessories:
  - 1. Oiltight key switch for key-to-test function.
  - 2. Oiltight green ON pilot light.
  - 3. Isolated neutral lug; 100 percent rating.
  - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 5. Form C alarm contacts that change state when switch is tripped.
  - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.

- 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
- 8. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
- 9. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
- 10. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
- 11. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating 120-V ac.
- 12. Hookstick Handle: Allows use of a hookstick to operate the handle.
- 13. Lugs: Mechanical type, suitable for number, size, and conductor material.
- 14. Service-Rated Switches: Labeled for use as service equipment.

## 2.6 MOLDED-CASE SWITCHES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. <u>Eaton</u>.
  - 2. <u>General Electric Company</u>.
  - 3. Square D; by Schneider Electric.
  - 4. Siemens Industry, Inc., Energy Management Division.
  - 5. NOARK Electric North America.
- B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- D. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs:
    - a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs shall be suitable for 194 deg F rated wire, sized according to the 167 deg F temperature rating in the CEC.
  - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

- 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
- 7. Alarm Switch: One NO contact that operates only when switch has tripped.
- 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
- 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
- 10. Electrical Operator: Provide remote control for on, off, and reset operations.
- 11. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac.

# 2.7 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- E. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

### 3.2 PREPARATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Construction Manager and Owner no fewer than ten working days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Owner's written permission.
  - 4. Comply with NFPA 70E.

## 3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
  - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

### 3.4 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with the CEC and NECA 1.

### 3.5 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

- 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
- 2. Label each enclosure with engraved metal or laminated-plastic nameplate.
- 3.6 FIELD QUALITY CONTROL
  - A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
  - C. Perform tests and inspections with the assistance of a factory-authorized service representative.
  - D. Tests and Inspections for Switches:
    - 1. Visual and Mechanical Inspection:
      - a. Inspect physical and mechanical condition.
      - b. Inspect anchorage, alignment, grounding, and clearances.
      - c. Verify that the unit is clean.
      - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
      - e. Verify that fuse sizes and types match the Specifications and Drawings.
      - f. Verify that each fuse has adequate mechanical support and contact integrity.
      - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
        - 1) Use a low-resistance ohmmeter.
          - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
        - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
          - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
      - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
      - i. Verify correct phase barrier installation.
      - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

- 2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with a lowresistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - c. Perform insulation-resistance tests for one minute on each pole, phase-tophase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
  - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- E. Tests and Inspections for Molded Case Circuit Breakers:
  - 1. Visual and Mechanical Inspection:
    - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, grounding, and clearances.
    - d. Verify that the unit is clean.
    - e. Operate the circuit breaker to ensure smooth operation.
    - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
      - 1) Use a low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

- g. Inspect operating mechanism, contacts, and chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.
- 2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with a lowresistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-tophase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
  - e. Determine the following by primary current injection:
    - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
  - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
  - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
  - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free,

anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.

- i. Verify operation of charging mechanism. Investigate units that do not function as designed.
- 3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 4. Perform the following infrared scan tests and inspections and prepare reports:
  - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
  - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
  - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
  - 1. Test procedures used.
  - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
  - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

### 3.7 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

END OF SECTION 262816

# SECTION 265119 - LED INTERIOR LIGHTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section includes the following types of LED luminaires:
  - 1. Cylinder.
  - 2. Downlight.
  - 3. Recessed, linear.
  - 4. Strip light.
  - 5. Surface mount, linear.
  - 6. Surface mount, nonlinear.
  - 7. Suspended, linear.
  - 8. Suspended, nonlinear.
  - 9. Luminaire accessories
  - 10. Light engines
  - 11. Drivers and lighting power supplies
  - 12. Supports for luminaires
- B. Related Requirements:
  - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
  - 2. Section 260926 "Lighting Control Panelboards" for panelboards used for lighting control.

### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.

- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

### 1.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.
  - 5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
  - 6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79.
    - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.

- C. Shop Drawings: Linear perimeter wall wash and wall graze luminaires.
  - 1. All continuous perimeter linear luminaire shall run wall-to-wall and provide with mitered corners. Submittal shall include exact run length plan drawings for all locations based on field verified dimensions.
- D. Delegated Design Submittals: For supports for luminaires, including mounting, anchoring, and attachment components, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Sustainable Design Submittals:
  - 1. Product Data: Indicating luminaire is certified by ENERGY STAR and Design Lights Consortium.
- F. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- G. Qualification Data: For professional engineer. Samples: For each luminaire and for each color and texture with standard factory-applied finish.
- H. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
  - 1. Include Samples of luminaires and accessories involving color and finish selection.
- I. Samples for Verification: For each type of luminaire.
  - 1. Include Samples of luminaires and accessories to verify finish selection.
- J. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Luminaires.
  - 2. Suspended ceiling components.
  - 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
  - 4. Structural members to which equipment and or luminaires will be attached.
  - 5. Initial access modules for acoustical tile, including size and locations.
  - 6. Items penetrating finished ceiling, including the following:
    - a. Other luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.

- d. Sprinklers.
- e. Access panels.
- f. Ceiling-mounted projectors.
- 7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 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.
- D. Product Certificates: For each type of luminaire.
- E. Product Test Reports: For each type of luminaire, for tests performed by a qualified testing agency.
- F. Sample warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Replaceable LED modules: 1 for each 20 [5%] of each type. Furnish at least 5 of each type.
  - 3. Drivers: 1 for each 10 [10%] of each type. Furnish at least 5 of each type.
  - 4. Diffusers/Lenses/Louvers: One for every 100 of each type and rating installed. Furnish at least one of each type.
  - 5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

### 1.9 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- D. All lighting fixtures shall be manufactured, furnished, and installed in compliance with all government agencies having jurisdiction. All fixtures shall bear the appropriate UL (or ETL) and IBEW identifications.
- E. Manufacturers and model # listed on the Lighting Fixture Schedule as the Basis of Design are the approved lighting fixture for each luminaire type. Those manufacturers shall be assumed capable of supplying the listed fixtures unless clearly written exceptions are set forth in their quotations. Any such exceptions shall immediately be brought to the attention of the Architect/Engineer and the Lighting Designer.

Manufacturers listed as approved equal are permitted to submit alternate products meeting the specification and the performance criteria as scheduled. Specifier shall have the final decision on suitability of any submittal item for this Project. Manufacturers listed as approved equal must submit with the following for review:

- 1. 3D photometric calculations for all spaces in the project with the proposed alternate product along with 3D photometric calculations with the Basis of Design products for comparison.
- 2. Submit (1) each working sample of the proposed alternate product and the Basis of Design product for review by the Lighting Designer. Minimum 4'-0" long required for linear fixtures. Submit control equipment for the sample fixtures if requested by the specifier. The samples must be supplied and shall be submitted with 120volt driver complete with cord and plug set and ready for hanging, energizing and examining. The sample shall be shipped (prepaid) by Contractor to the Lighting Designer or as otherwise specified or directed
- F. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.
  - 1. Obtain Architect's approval of luminaires in mockups before starting installations.
  - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  - <u>5.</u> The specific design requirements of several conditions will mandate the necessity of full-scale mockups prior to final authorization (release) to fabricate.

The Contractor shall include as part of his bid provision for complete mockups including luminaire supports of the following conditions including control system. All mockup fixtures shall be installed as indicated on drawings / schedule and energized for review.

### 1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

## 1.11 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) minimum from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Supports for Luminaires: Supports for luminaires shall withstand the effects of gravity loads and stresses within limits and under conditions indicated.
  - 1. Luminaire-mounting supports shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- B. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."
- D. Ambient Temperature: 41 to 104 deg F.
  - 1. Relative Humidity: Zero to 95 percent.
- E. Altitude: Sea level to 1000 feet.

## 2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- F. California Title 24 compliant.
- G. LED and drivers
  - 1. Light emitting diodes used for interior applications shall have CRI as scheduled, with a minimum CRI of 80 if not identified. CRI of LEDs shall also have a CQS value matching the CRI, following the NIST color quality scale. CCT shall be as scheduled.
  - 2. LED luminaires shall have integral light engine, heat sink, driver, and optic package. Minimum LM-80 depreciation to L70 at 50,000 hours under installed conditions. Minimum CRI of 85 with less than 50K CCT shift over mean life, binning to 2-step McAdams ellipse.
  - 3. LED light engines shall be thermally fixed to heat sinks sized to appropriately dissipate gate heat under design load in the installed conditions. Lumen maintenance calculations shall be based upon the average ambient temperature at the luminaire housing or cavity area. All interior LED luminaires shall be designed to meet an L70 mean life of at least 50,000 hours with scheduled drive currents.
  - 4. LED drivers
    - a. Drivers shall be solid state with integral heat sink. Driver shall have overload and short circuit protection, with a power factor of 0.9 to 1.0 and maximum THD of 20%.
    - b. Remote drivers shall be enclosed in NEMA enclosures.
    - c. Drivers shall be dimmable as scheduled.
    - d. Drivers shall have minimum mean life of 50,000 hours, with unlimited switching.
  - 5. LED dimming and color control:

- a. Verify that all scheduled LED luminaire drivers are compatible with the means of control indicated, either DMX-512, 0-10VDC, or low voltage dimmer.
- b. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified power supplies and/or drivers.
- H. Luminaire Accessories
  - 1. Extra lenses, louvers, snoots, and other scheduled accessories shall be installed as directed by Specifier during system aiming and commissioning. All unused accessories shall be turned over to Owner after commissioning for attic stock.

## 2.3 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Steel:
  - 1. ASTM A36/A36M for carbon structural steel.
  - 2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:
  - 1. 1. Manufacturer's standard grade.
  - 2. 2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

### 2.4 FINISHES

- A. Painted surfaces shall be synthetic enamel with acrylic, alkyd, epoxy, polyester or polyurethane base, light stabilized, baked on at 350 degrees Fahrenheit minimum, catalytically or photochemically polymerized after application.
- B. White finishes minimum 90% reflectance (semi-gloss).
- C. Selection: Unless otherwise indicated, all external fixture finishes shall be as selected by the Architect/Engineer. Unless otherwise indicated, all fixture finishes shall be semigloss polyester powder coat enamel (color to be selected by Architect).
- D. Undercoat: Except for stainless steel all ferrous metal surfaces shall be given a five stage phosphate treatment or other acceptable base bonding treatment before final painting and after fabrication.

- E. Unpainted non-reflecting surfaces shall be satin finished and coated with a baked-on clear lacquer to preserve the finish. Where aluminum surfaces are treated with an anodic process, the clear lacquer coating may be omitted.
- F. Unpainted aluminum surfaces: Finish interior aluminum trims with an anodized coating of not less than 7 mg. per square inch, of a color and surface finish as selected by the Architect/Engineer. Finish exterior aluminum and aluminum trims with an anodized coating of not less than 35 mg. per square inch of a color and surface finish as selected by the Architect/Engineer.
- G. Metal finishes: Provide finishes of the color and type indicated and having the following properties:
  - 1. Protection of metal from corrosion: 5-year warranty against perforation of erosion of the finish from weathering.
  - 2. Color retention: 5-year warranty against fading, staining, or chalking from weathering including solar radiation.
  - 3. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.
- H. In situations where lighting fixture trims are painted to match the ceiling, the fixture trims being painted must be removed from the fixture housing and painted away from the ceiling. Reseat back into housing only after paint is completely dry. Do not paint in place. Damage to the ceiling caused by painting trims in place to be fixed by the Contractor at Contractor's expense.

# 2.5 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gauge.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### 2.6 MISCELLANEOUS

A. Where (or if) indicated all remote step-down transformers and ballasts shall be properly wired to fixtures to ensure that voltage drop does not exceed 5%, regardless of transformer's or ballast's location.
- B. All remote step-down transformers and drivers shall be mounted in approved NEMA type enclosures and only located in areas previously deemed to be readily accessible by the Owner's maintenance personnel.
- C. All fixture lengths whether straight or curvilinear shall be fabricated based upon the fixture manufacturer's or contractor's field verified dimensions only.
- D. Fixture manufacturer shall coordinate conduit entry locations with installing contractor.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

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

# 3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

### 3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:

- 1. Secured to outlet box.
- 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
- 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaires:
  - 1. Attached to a minimum 20 gauge backing plate attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Suspended Luminaires:
  - 1. Ceiling Mount:
    - a. Pendant mount with 5/32-inch- diameter aircraft cable supports 10 feet in length.
    - b. Hook mount.
  - 2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
  - 5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- H. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
- I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

### 3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.
- 3.6 STARTUP SERVICE
- 3.7 Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."
- 3.8 Illumination Levels and Scene Adjustments: After the entire installation is complete, including but not limited to installation of finishes, furniture, and/or artwork, provide onsite assistance in adjusting system light illumination levels and scenes. Provide up to two (2) 8-hour day visits to Project during other-than-normal occupancy hours for this purpose. Contractor to coordinate with Owner for potential end-user training.

### 3.9 AIMING

- A. All adjustable lighting units shall be aimed, focused, locked, etc., by the Contractor under the supervision of the Lighting Designer. The Lighting Designer shall indicate the number of crews (foreman and apprentice) required. All aiming and adjusting shall be carried out after the entire installation is complete. All ladders, scaffolds, lift equipment, safety belts, flashlights, walkie talkie equipment, etc. required shall be furnished by the Contractor at the direction of the Lighting Designer. As aiming and adjusting is completed, locking set screws and bolts and nuts shall be tightened securely.
- B. Night work: Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing, aiming shall be accomplished at night.

### 3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

- 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
- 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

# SECTION 265213 - EMERGENCY AND EXIT LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Emergency lighting units.
  - 2. Exit signs.
  - 3. Luminaire supports.

#### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
  - 1. Include data on features, accessories, and finishes.
  - 2. Include physical description of the unit and dimensions.
  - 3. Battery and charger for light units.
  - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

- a. Testing Agency Certified Data: For indicated luminaires and signs, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires and signs shall be certified by manufacturer.
- b. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each product and for each color and texture specified.
- D. Samples for Initial Selection: For each type of luminaire with factory-applied finishes.
- E. Samples for Verification: For each type of luminaire.
  - 1. Include Samples of luminaires and accessories to verify finish selection.
- F. Product Schedule:
  - 1. For emergency lighting units. Use same designations indicated on Drawings.
  - 2. For exit signs. Use same designations indicated on Drawings.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Luminaires.
  - 2. Suspended ceiling components.
  - 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
  - 4. Structural members to which equipment will be attached.
  - 5. Size and location of initial access modules for acoustical tile.
  - 6. Items penetrating finished ceiling including the following:
    - a. Other luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Ceiling-mounted projectors.
    - e. Sprinklers.
    - f. Access panels.

- 7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Product Certificates: For each type of luminaire.
- D. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 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.
  - 4. Provide seismic qualification certificate for each piece of equipment.
- E. Product Test Reports: For each luminaire for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Sample Warranty: For manufacturer's warranty.

### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

# 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
  - 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
  - 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

# 1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.
  - 1. Obtain Architect's approval of luminaires and signs in mockups before starting installations.
  - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

# 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

### 1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Emergency Power Unit Batteries: Five years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.
  - 2. Warranty Period for Self-Powered Exit Sign Batteries: Five years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

### 2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with the CEC and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61.
- G. Bulb Shape: Complying with ANSI C79.1.
- H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with led driver.
  - 1. Emergency Connection: Operate one lamp(s) continuously at an output of 1400 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
  - 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
    - b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
    - c. Humidity: More than 95 percent (condensing).

- d. Altitude: Exceeding 3300 feet (1000 m).
- 4. Nightlight Connection: Operate lamp continuously at 40 percent of rated light output.
- 5. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
  - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- 6. Battery: Sealed, maintenance-free, lithium-ion type.
- 7. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
- 8. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
- 9. Integral Self-Test: Factory-installed electronic device automatically initiates coderequired test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- I. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.
  - 1. Emergency Connection: Operate one LED lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire driver.
  - 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 3. Nightlight Connection: Operate lamp in a remote luminaire continuously.
  - 4. Battery: Sealed, maintenance-free, lithium-ion type.
  - 5. Charger: Fully automatic, solid-state, constant-current type.
  - 6. Housing: NEMA 250, Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly shall be located no less than half the distance recommended by the emergency power unit manufacturer, whichever is less.
  - 7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - 8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - 9. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
  - 10. Integral Self-Test: Factory-installed electronic device automatically initiates coderequired test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

- a. Manufacturer:
  - 1) Controlled Power
- 2.3 EMERGENCY LIGHTING
  - A. General Requirements for Emergency Lighting Units: Self-contained units.
  - B. Emergency Luminaires:
  - C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - D. Description:
    - a. Operating at nominal voltage of 277 V ac Coordinate requirements below with "Emergency Power Units" Article.
    - b. External emergency power unit.
    - c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
    - d. UL 94 5VA flame rating.
    - 2. Emergency Luminaires: Fixtures as indicated on drawings and described in Section 26 51 00, with the following additional features:
      - a. Operating at nominal voltage of 277 V ac Coordinate requirements below with "Emergency Power Units" Article.
      - b. External emergency power unit.
      - c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
      - d. UL 94 5VA flame rating.
- 2.4 EXIT SIGNS
  - A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
  - B. Internally Lighted Signs:
    - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by the following:
      - a. Lithonia Lighting; Acuity Brands Lighting, Inc.
    - 2. Operating at nominal voltage of 120 V ac.
    - 3. Lamps for AC Operation: Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
    - 4. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
    - 5. Master/Remote Sign Configurations:

- a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in battery for power connection to remote unit.
- b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.
- C. Self-Luminous Signs: Not allowed.

# 2.5 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
  - 1. Smooth operating, free of light leakage under operating conditions.
  - 2. Designed to permit relamping without use of tools.
  - 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  - 1. Clear glass.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
  - 3. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- D. Housings:
  - 1. Extruded aluminum housing and heat sink.
  - 2. Clear powder coat finish.
- E. Conduit: Rigid galvanized steel, minimum 3/4 inch (21 mm) in diameter.

### 2.6 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### 2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire and emergency power unit weight.
  - 2. Able to maintain luminaire position when testing emergency power unit.
  - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
  - 1. Attached to a minimum 20-gage backing plate attached to wall structural members.
  - 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:

- 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
- 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
- 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
- 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling Grid Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

# 3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

### 3.5 STARTUP SERVICE

- A. Perform startup service:
  - 1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
  - 2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

### 3.6 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
  - 1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
    - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265213

### SECTION 323113 - CHAINLINK FENCING AND GATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

This section shall consist of:

- Chain-link fences,
- Swing gates,
- Privacy slats,

#### A. Reference Standards:

1. This Technical Specification makes references to the Standard Specifications for Public Works Construction (Greenbook).

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Fence and gate posts, rails, and fittings.
    - b. Chain-link fabric, reinforcements, and attachments.
    - c. Accessories: Privacy slats
    - d. Gates and hardware.
    - e. Gate operators.
- B. Shop Drawings: For each type of fence and gate assembly.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include accessories, hardware, gate operation, and operational clearances.
- C. Samples for Initial Selection: For each type of factory-applied finish.
- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
  - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

E. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 QUALITY CONTROL

- A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

#### 1.4 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to comply with performance requirements.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - c. Faulty operation of gate operators and controls.
  - 2. Warranty Period: 5 years from date of Substantial Completion.

### PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
  - A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

- 1. Design Wind Load: 100 mph.
  - a. Minimum Post Size: Determine according to ASTM F 1043 for post spacing not to exceed 10 feet.
  - b. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.
- B. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

### 2.2 FENCE FRAMEWORK

- A. Posts and Rails. ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
  - 1. Fence Height: See project plans
  - 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40
    - a. Line Post: 2.375 inches in diameter
    - b. End, Corner, and Pull Posts: 2.375 inches in diameter
  - 3. Horizontal Framework Members: top and bottom rails according to ASTM F 1043.
    - a. Top Rail: 1.66 inches in diameter
  - 4. Brace Rails: ASTM F 1043.
  - 5. Metallic Coating for Steel Framework:
    - a. Type A: Not less than minimum 2.0-oz./sq. ft average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating according to ASTM A 653/A 653M.

#### 2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:
  - 1. Type II: Zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:

Matching chain-link fabric coating weight.

#### 2.4 SWING GATES

- A. General: ASTM F 900 for gate posts single and double swing gate types.
  - 1. Gate Leaf Width: As indicated.
  - 2. Framework Member Sizes and Strength: Based on gate fabric height of 72 inches.
- B. Pipe and Tubing:

a.

- 1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
- 2. Gate Posts: Round tubular steel
- 3. Gate Frames and Bracing: Round tubular steel
- C. Frame Corner Construction: Welded or assembled with corner fittings.
- D. Hardware:
  - 1. Hinges: 360-degree inward and outward swing.
  - 2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
  - 3. Lock: Padlock keyed for Owner.

#### 2.5 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.
  - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
  - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and

bottom rails to posts.

- 3. Tension and Brace Bands: Pressed steel
- 4. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- E. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- F. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - a. Hot-Dip Galvanized Steel: 0.106-inch diameter wire galvanized coating thickness matching coating thickness of chain-link fence fabric.

#### 2.6 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

### 2.7 CHAINLINK FOOTING AND MOW CURB CONCRETE

A. Footing and mow curb concrete: 2500 psi concrete mix at 27 day cure period and as shown on plans and details.

#### 2.8 GROUNDING MATERIALS

- A. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.
  - 1. Connectors for Below-Grade Use: Exothermic welded type.
  - 2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
  - 1. Do not begin installation before final grading is completed unless otherwise permitted by Client.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
- 3.3 CHAIN-LINK FENCE INSTALLATION
  - A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
  - B. Install fencing on established boundary lines inside property line.
  - C. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
  - D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
    - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
    - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
      - a. Concealed Concrete: Place top of concrete 2 inches below grade as indicated on Drawings to allow covering with surface material.
  - E. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

- F. Line Posts: Space line posts uniformly at 10 feet o.c.
- G. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
- H. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- I. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- J. Intermediate and Bottom Rails: Secure to posts with fittings.
- K. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- L. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.
- M. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- N. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

### 3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for

full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

#### 3.5 GROUNDING AND BONDING

- A. Fence and Gate Grounding:
  - 1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
  - 2. Install ground rods and connections at maximum intervals of 1,500 feet.
  - 3. Fences within 50 feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 100 feet.
  - 4. Ground fence on each side of gates and other fence openings.
    - a. Bond metal gates to gate posts.
    - b. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a ground rod located a maximum distance of 150 feet on each side of crossing.
- C. Fences Enclosing Electrical Power Distribution Equipment: Ground according to IEEE C2 unless otherwise indicated.
- D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
  - 1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
  - 2. Make grounding connections to each barbed tape coil with connectors designed for this purpose.
- E. Connections:
  - 1. Make connections with clean, bare metal at points of contact.
  - 2. Make aluminum-to-steel connections with stainless-steel separators and

mechanical clamps.

- 3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
- 4. Make above-grade ground connections with mechanical fasteners.
- 5. Make below-grade ground connections with exothermic welds.
- 6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- F. Bonding to Lightning Protection System: Ground fence and bond fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor according to NFPA 780.

#### 3.6 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

#### 3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 32 31 13