



PROJECT MANUAL

FOOTHILLS ADULT EDUCATION CENTER

GROSSMONT UNION HIGH SCHOOL DISTRICT

EL CAJON, CA

CONSTRUCTION DOCUMENTS

DSA No. 04-119728

File No. 37-H4

VOLUME 1 OF 1

1.30.47

February 2021

SECTION 00 01 01
PROJECT TITLE PAGE

FOR

FOOTHILLS ADULT EDUCATION CENTER

PROJECT NUMBER: 1-30-47

DISTRICT

GROSSMONT UNION HIGH SCHOOL DISTRICT

1100 MURRAY DRIVE, EL CAJON, CA 92020

WWW.GUHSD.NET

PROJECT LOCATION

GROSSMONT EDUCATION CENTER

1550 MELODY LANE

EL CAJON , CALIFORNIA 92019

PREPARED BY:

ARCHITECT

RUHNAU CLARKE ARCHITECTS

5751 Palmer Way, Suite C, Carlsbad CA 92010

760.931.8194

www.ruhnauclarke.com

NOTICE: This Project Manual, is an unpublished instrument of service of the authors. It is prepared for use only on this Project and in conjunction with the authors' interpretations, observations, decisions and administration, as described in the Conditions of the Contract. Desired results without these services cannot be assured. Use in whole or in part, without the authors' services and expressed written consent may violate Act 17 U.S.C. par. 301 (1991).

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: Foothills Adult Education Center, located at:
Project Number: 1-30-47.
Grossmont Education Center.
1550 Melody Lane.
El Cajon, California 92019.
- B. The Owner, hereinafter referred to as District: Grossmont Union High School District
Grossmont Union High School District
1100 Murray Drive, El Cajon, CA 92020
www.guhsd.net
619.644.8000

1.02 NOTICE TO PROSPECTIVE BIDDERS

- A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION

- A. Summary Project Description: Interior remodel.
- B. Contract Scope: Construction, demolition, and renovation.
- C. Contract Terms: Lump sum (fixed price, stipulated sum).

1.04 PROJECT CONSULTANTS

- A. The Architect, hereinafter referred to as Architect: **Ruhnau Clarke Architects**
5751 Palmer Way, Suite C, Carlsbad CA 92010
www.ruhnauclarke.com
760.931.8194

1.05 PROCUREMENT TIMETABLE

- A. Last Request for Substitution Due: 14 days prior to due date of bids.
- B. Last Request for Information Due: 14 days prior to due date of bids.
- C. Bid Opening: Same day, 3 PM local time.
- D. Bids May Not Be Withdrawn Until: 30 days after due date.
- E. Contract Time: To be stated in bid documents.
- F. The District reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:

1. From District at the Project Manager's address listed above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 01 07
SEALS PAGE

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 04-119728 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 02/18/2021

ARCHITECT OF RECORD (AOR)

RUHNAU CLARKE ARCHITECTS

5751 Palmer Way, Suite C, Carlsbad CA 92010

David Ruhnu, Architect of Record C-20662



STRUCTURAL ENGINEER OF RECORD (SEOR)

KNA CONSULTING ENGINEERS, INC.

9931 Muirlands Blvd., Irvine, CA 92618

Larry Kaprielian S-2795



MECHANICAL ENGINEER OF RECORD (MEOR)

MA ENGINEERS

5160 Carroll Canyon Road, Suite 200, San Diego CA 92121

Roy C. Campbell M-025911



ELECTRICAL ENGINEER OF RECORD (EEOR)

JOHNSON CONSULTING ENGINEERS, INC.

12875 Brookprinter Place, #300, Poway CA 92064

Monica Goese-Hansen E-14781



FIRE PROTECTION ENGINEER OF RECORD (FPOR)

PROTECTION DESIGN AND CONSULTING

2851 Camino Del Rio S. #210, San Diego CA 92108
Jonathon S. Mitchell FP-1559



LANDSCAPE ARCHITECT OF RECORD (LAOR)

MM+LA ASSOCIATES

1982 White Birch Drive, Vista CA 92081
Brandt Maughan LA-1870



END OF SEALS PAGE

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SECTION 00 40 25
REQUEST FOR INFORMATION

RFI NUMBER: _____

DATE: _____

PROJECT NAME: FOOTHILLS ADULT EDUCATION CENTER

PROJECT NO.: 1-30-47

TO: RUHNAU CLARKE ARCHITECTS

5751 Palmer Way, Suite C, Carlsbad CA 92010

Attention: _____

Contractor: _____

Address: _____

Request By: _____ Date: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

Attachments: _____

RESPONSE WILL BE INCLUDED IN AN ADDENDUM

END OF RFI

SECTION 00 43 25
SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

SUBSTITUTION REQUEST NO. _____

DATE: _____

PROJECT NAME: **FOOTHILLS ADULT EDUCATION CENTER**

PROJECT NUMBER: **1-30-47**

TO: **RUHNAU CLARKE ARCHITECTS**

5751 Palmer Way, Suite C, Carlsbad CA 92010

From: _____

We hereby submit for your consideration the following product comparisons of the specified product and the proposed substitution. The undersigned fully understands that failure to answer any item below may be cause for rejection of request for substitution.

Request for substitution shall only be made during bidding (not later than 7 days prior to bid opening for inclusion by Addendum) except under conditions beyond control of Contractor.

SPECIFIED PRODUCT: _____

Project Manual Section Title _____ Number ____ Page ____ Paragraph ____.

Drawing No. _____ Detail No. _____

Proposed Substitution: _____

Manufacturer: _____ Tel: _____

A. Is the point-by-point comparative data attached? — REQUIRED BY A/E

B. Reason request for substitution is being submitted: _____

DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT

A. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No__ Yes__

Explain _____

B. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No__ Yes__

Explain _____

- C. Does proposed substitution require changes in Drawings or design and installation changes?
 No___ Yes___ _____
 (If yes, cost of these changes is the responsibility of the Contractor.)
- D. Does proposed substitution affect product cost, delivery time, or construction schedule?
 No___ Yes___ Explain _____
- E. Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers?
 No___ Yes___ Explain _____
- F. Does proposed substitution affect other trades and systems such as wiring, piping, ductwork, structure, etc.? No ___ Yes ___ (Explain which and how) _____

- G. Does proposed substitution product guarantee differ from that of the specified product?
 No___ Yes___ Explain _____

Attach a listing of 3 similar projects (one in service for at least 3 years) using the proposed substitution.

Substantiating Data: Attach product data/brochures and Vendor qualifications for both specified and substitute product. Provide samples for both specified and substitute products, if applicable.

Certification: Undersigned has examined Construction Documents, is familiar with specified product, understands indicated application of product, and understands design intent of the Architect caused by the requested substitution.

Submitted by: _____

(Type Name)

Signature

Date

Signature must be made by person having legal authority to bind his firm to the above terms.

END OF SECTION

SECTION 00 63 25
SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

SUBSTITUTION REQUEST NO. _____

DATE: _____

PROJECT NAME: **FOOTHILLS ADULT EDUCATION CENTER**

PROJECT NUMBER: **1-30-47**

TO: **RUHNAU CLARKE ARCHITECTS**

5751 Palmer Way, Suite C, Carlsbad CA 92010

From: _____

We hereby submit for your consideration the following product comparisons of the specified product and the proposed substitution. The undersigned fully understands that failure to answer any item below may be cause for rejection of request for substitution.

This request for substitution form shall only be used after the end of the bidding period except under conditions beyond control of Contractor.

Specified Product: _____

Project Manual Section Title _____ Number ____ Page ____ Paragraph ____.

Drawing No. _____ Detail No. _____

Proposed Substitution: _____

Manufacturer: _____ Tel: _____

A. Reason request for substitution is being submitted: _____

B. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No__ Yes__

Explain _____

C. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No__ Yes__

Explain _____

D. Does proposed substitution require changes in Drawings or design and installation changes? No__ Yes__

(If yes, cost of Architect and Engineer document changes are the responsibility of the Contractor.)

- E. Does proposed substitution affect product cost, delivery time, or construction schedule?
No___Yes___ Explain _____
- F. Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers?
No___Yes___ Explain _____
- G. Does proposed substitution affect other trades and systems such as wiring, piping, ductwork, structure, etc.? No_____Yes_____ (Explain which and how)

If yes, has impact on their work been included in price of proposed substitution? No__ Yes__.

- H. Does proposed substitution product guarantee differ from that of the specified product?
 No Yes Explain

If the substitution request is accepted, it will result in:

No cost impact	Improve Schedule	Credit of \$

Attach a listing of 3 projects (one in service for at least 3 years) using the proposed substitution.

Substantiating Data: Attach product data/brochures and Vendor qualifications for both specified and substitute product. Provide samples for both specified and substitute products, if applicable.

Certification: Undersigned has examined Construction Documents, is familiar with specified product, understands indicated application of product, and understands design intent of the Architect caused by the requested substitution.

Submitted by: _____
(Type Name) Signature Date

Signature must be made by person having legal authority to bind his firm to the above terms.

Architect's Comments:

Accepted, accepted as noted, not accepted, received too late.

Reviewed by:

Architect

Date

Construction Manager

Date

District

Date _____

END OF SECTION

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Foothills Adult Education Center
- B. District's Name: Grossmont Union High School District.
- C. Architect's Name: Ruhnau Clarke Architects.
- D. The Project consists of the alteration of an interior located at Grossmont Education Center.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: Multiple prime contracts each based on a Stipulated Price as described in Owner-Contractor Agreement.
- B. The work of each separate prime contract is identified in this section and on Drawings.
- C. The Work: The Work is construction and related services for a , CBC, Occupancy Type Educational Group E, Construction Type V-B, , totaling approximately 32806 square feet.
 - 1. The Work includes remodeling of an existing building, interior improvements, building utilities, and related site improvements; with patch and repair as required, and other features to the extent indicated on the Drawings.

1.03 CONTRACT DOCUMENTS

- A. Contract Requirements:
 - 1. Conditions of the Contract and other Contract documents have been included in the Project Manual, as indicated in the Table of Contents.
 - a. Such documents are not Specifications.
 - 2. Specifications are found in Divisions 01 through 32 of the Project Manual.
- B. Contract Drawings: The Drawings provided with and identified in the Project Manual are the Drawings referenced in the Agreement.
 - 1. The location, extent and configuration of the required construction and improvements are shown and noted on Drawings.
 - a. The Drawings are referenced in the Agreement.
 - b. An index of Drawings is included in the set of Drawings.
 - 2. Drawings are arranged into series according to design discipline. Such organization and all references to trades, subcontractor, specialty contractor or supplier shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of the Work to be performed by any trade.
 - 3. Where the terms "as shown", "as indicated", "as noted", "as detailed", "as scheduled", or terms of like meaning, are used in the Drawings or Specifications, it shall be understood that reference is being made to the Drawings referenced in the Agreement.

4. Where reference to the word "plans" is made anywhere in Drawings, Specifications and related Contract Documents, it shall be understood to mean the Drawings referenced in the Agreement.
- C. Contract Specifications: The Specifications provided in the Project Manual are the Specifications referenced in the Agreement.
 1. Specifications are organized by Divisions and Sections in accordance with the recommended practices of the Construction Specifications Institute.
 - a. Such organization shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade.
 2. Specifications are included in the Project Manual, which may also include other Bidding and Contract Documents.
 - a. Contents of the Project Manual are listed in Document 00 01 10 - Table of Contents, in the Project Manual.

1.04 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.
 1. The intent of these drawings and specifications are the work of the alteration, rehabilitation, or reconstruction of this facility shall be submitted and approved by DSA before proceeding with the repair work. CAC Section 4-317.
- B. Scope of alterations work is indicated on drawings.
- C. Plumbing: Alter existing system and add new construction, keeping existing in operation.
- D. HVAC: Alter existing system and add new construction, keeping existing in operation.
- E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.
- F. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.
- G. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
- H. Telephone: Alter existing system and add new construction, keeping existing in operation.
- I. Security System: Alter existing system and add new construction, keeping existing in operation.
- J. Communications: Alter existing system and add new construction, keeping existing in operation.

1.05 WORK BY OWNER

- A. Concurrent Work Under Separate Contracts:
 1. Work Under Separate Contracts: District will award separate contracts for products and installation for interior improvements and other work as may be indicated on Drawings as NIC (Not in Contract).
 2. Relationship to Work Under the Contract:

- a. Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing.
 - b. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein.
- 3. Related Contract Documents:
 - a. District will make available, in a timely manner, drawings and specifications of work under separate contracts for coordination and further description of that work.
 - b. Such drawings and other data required for the coordination of the work of separate contracts with the Work of this Contract may be included with the Contract Documents.
 - c. If so, they are provided for convenience only and are not to be considered Contract Documents produced by Architect or Architect's consultants.
- 4. Permits, Notices and Fees:
 - a. Permits, Notices and Fees: Notices required by and approvals required of authorities having jurisdiction for work under separate contracts and related fees will be solely the responsibility of District.
- B. Items noted NIC (Not in Contract) will be supplied and installed by District before Substantial Completion. Some items include:
 - 1. Movable cabinets.
 - 2. Furnishings.
 - 3. Small equipment.
 - 4. Rugs.
 - 5. Artwork.
- C. District will supply the following for installation by Contractor:
 - 1. Owner-Furnished Products: District may furnish, for installation by Contractor, products which are identified on the Drawings and in the Specifications as OFCI (Owner-Furnished/Contractor-Installed).
 - 2. Relationship to Work Under the Contract:
 - a. Work under the Contract shall include all provisions necessary to fully incorporate such products into the Work, including, as necessary.
 - 1) Fasteners.
 - 2) Backing,.
 - 3) Supports.
 - 4) Piping.
 - 5) Conduit.
 - 6) Conductors.
 - 7) Other such provisions from point of service to point of connection.
 - 8) Field finishing, as shown on Drawings and specified herein.
 - b. See Section 01 30 00 - Administrative Requirements for additional requirements.

1.06 PERMITS, LICENSES AND FEES

A. Permits:

1. For Work included in the Contract, Contractor shall obtain all permits from authorities having jurisdiction and from serving utility companies and agencies.
2. District will reimburse Contractor for amount charged for such permits, without mark-up.
3. For Work performed under design/build basis, plan check and permit fees shall be included in the Contract Sum.

B. Licenses:

1. Contractor shall obtain and pay all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses.
2. All costs for licenses shall be included in the Contract Sum.

C. Assessments:

1. District will pay all assessments and utility service connection fees. Costs of assessments shall not be included in the Contract Sum.

D. Test and Inspection Fees:

1. Contractor shall pay all fees charged by authorities having jurisdiction and from serving utility companies and agencies, for tests and inspections conducted by those authorities, companies and agencies.
2. District will reimburse Contractor for actual amount of such fees, without mark-up.
3. Refer to Section 01 40 00 - Quality Requirements for additional information on tests and inspections and responsibility for payment of fees.

1.07 OWNER OCCUPANCY

- A. District intends to continue to occupy adjacent portions of the existing site during the entire construction period.
- B. District intends to occupy the Project upon Substantial Completion.
- C. Cooperate with District to minimize conflict and to facilitate District's operations.
- D. Schedule the Work to accommodate District occupancy.

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 1. District occupancy.
 2. Work by Others.
 3. Work by District.
 4. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by District:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Site Access:
 - a. Limit access to site to indicated routes and access points as indicated.
 - b. If routes and access points are not indicated, access shall be as approved by District.
 - c. Do not restrict access to adjacent properties and do not restrict access for those performing work under separate contracts for the District.
3. Do not obstruct roadways, sidewalks, or other public ways without permit.
4. Construction Limit:
 - a. Limit construction activities to areas indicated on Drawings as Project Area or, if not indicated, to areas within the parcel as described in the legal description on the Drawings.
 - b. Refer also to Section 01 50 00 - Temporary Construction Facilities and Controls for additional requirements.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions:
 1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of 8 AM to 6 PM.
 2. Limit conduct of especially noisy interior work to the hours of 9 AM to 4 PM.
- F. Utility Outages and Shutdown:
 1. Limit disruption of utility services to hours the site is unoccupied.
 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to District and authorities having jurisdiction.
 3. Prevent accidental disruption of utility services to other facilities.

1.09 CONSTRUCTION WASTE MANAGEMENT

- A. Construction and waste management, complying with Section 01 74 19 - Construction Waste Management and Disposal, is a requirement for this project.
- B. The Contractor, Prime Contractors, and subcontractors all have obligations in meeting the requirements of this specification.

1.10 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01 20 00 - Price and Payment Procedures.
- C. Section 01 30 00 - Administrative Requirements.
- D. Section 01 31 14 - Facility Services Coordination.
- E. Section 01 40 00 - Quality Requirements.
- F. Section 01 50 00 - Temporary Facilities and Controls.

- G. Section 01 58 13 - Temporary Project Signage.
- H. Section 01 60 00 - Product Requirements.
- I. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- J. Section 01 70 00 - Execution and Closeout Requirements.
- K. Section 01 78 00 - Closeout Submittals.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form:
 - 1. Form provided by District.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- G. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- H. Revise schedule to list approved Change Orders, with each Application For Payment.
 - 1. List each authorized Change Order as an extension on the continuation sheet, listing the Change Order number and dollar value as for an original portion of Work.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
 - 1. Substantiating information will normally be required only for those portions of Work whose completion state cannot be readily determined by observation of the completed Work.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Balance to Finish.
 - 9. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
 - 1. No Change Orders shall be included with Application for Payment until approved in writing by District and Architect. Also approved by DSA when appropriate.
- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 30 00.
 - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 - 3. Current construction photographs specified in Section 01 30 00.
 - 4. Partial release of liens from major subcontractors and vendors.
 - a. Provide with each Application for Payment lien releases from all subcontractors, workers and materials suppliers employed for the Project covering their portion of Work to date for which payment application is made. Lien release forms will be provided by District and shall be completed in accordance with directions provided.
 - 5. Project record documents as specified in Section 01 78 00, for review by District which will be returned to the Contractor.
 - 6. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 ADDENDA

- A. Addenda are changes issued prior to the signing of the Contract for Construction. These Addenda shall be signed by the Architect and approved by the Division of the State Architect.

- B. These documents may or may not have approved by the Division of the State Architect prior to the close of Bid.
 - 1. If not approved by DSA prior to close of the bidding period, the contract price shall include the Addenda.
 - 2. No work shall proceed regarding any Addendum until approved by DSA.
 - 3. Revisions to Addenda, when approved by DSA, shall be incorporated by an additional addendum or Change Order as indicated below and as provided for in the Contract for Construction and General Conditions.

1.06 MODIFICATION PROCEDURES

- A. Construction Changes, General:
 - 1. The following describe administrative procedures to be followed in compliance with provisions of the Conditions of the Contract for Architect's Supplemental Instructions, Construction Change Directives, Construction Change Documents, and Contract Change Orders.
 - 2. The Architect will prepare and issue: Architect's Supplemental Instructions, a Construction Change Directive or a Request for Proposal to be presented to the Contractor for action.
- B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- C. Contract Change Order Forms: Form as directed by District.
- D. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
 - 1. Architect's Supplemental Instructions:
 - a. Minor changes in the Work, not involving an adjustment in either the Contract Sum or Contract Time, as authorized by the Conditions of the Contract, will be presented by the Architect using the Architect's Bulletin form.
 - b. Should the Architect's Supplemental Instructions result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the Conditions of the Contract.
- E. DSA Construction Change Document approval for substitutions and changes to structural, accessibility, or fire-life-safety portions of approved Drawings and Specifications is required from DSA prior to fabrication and installation. DSA IR A-6; CAC Section 4-215, & 4-233(c).
 - 1. The approved Construction Change Document shall be signed by:
 - a. Architect of Record.
 - b. When applicable:
 - 1) Structural Engineer of Record.
 - 2) Mechanical Engineer of Record.
 - 3) Electrical Engineer of Record.
 - 4) Civil Engineer of Record.
 - 5) Delegated Professional Engineer.
 - c. Division of the State Architect for final approval.

- F. For other required changes, not involving structural, accessibility, or fire-life-safety portions of approved Drawings and Specifications, Architect will issue a document signed by District instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
 3. Construction Change Directives: In accordance with provisions of the Conditions of the Contract, the District may direct the Contractor to proceed with a change in the Work prior to formal preparation, review and agreement of a Contract Change Order, in order to not delay construction.
 - a. The Architect will prepare and issue a change document containing a Construction Change Directive which, when signed by the District and the Architect, shall instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Contract Change Order.
 - b. Should the Construction Change Directive result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the Conditions of the Contract.
 - c. Construction Change Directives shall follow procedures specified below for Contract Change Orders except that Contractor shall immediately proceed with the change upon receipt of the signed Change Directive.
- G. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.
1. Such Request for Proposal may include an estimate of additions or deductions in Contract Time and Contract Sum for executing the change and may include stipulations regarding overtime work and the period of time the requested response from the Contractor shall be considered valid.
- H. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 60 00.
1. After review of the request and with the District's approval, the Architect will prepare a change document containing a Request for Proposal, as described above.
 2. Issuance of such a request by the Architect shall not indicate authorization of the Contractor to proceed with the proposed change.
 3. Changes will be approved only by an approved Construction Change Directive and Contract Change Order.
- I. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- J. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
 - a. Cost and Time Resolution: If amounts for changes in Contract Sum and Contract Time cannot be agreed upon by District and Contractor, amounts shall be resolved in accordance with provisions of the Conditions of the Contract for resolution of disputes and the following:
 - 1) Contractor shall keep accurate records of time, both labor and calendar days, and cost of materials and equipment.
 - 2) Contractor shall prepare and submit an itemized account and supporting data after completion of changed Work, within the time limits indicated in the Conditions of the Contract.
 - 3) Contractor shall provide full information as required and requested, for District and Architect to evaluate and substantiate proposed costs and time for the change in the Work.
 - 4) When District and Contractor determine mutually acceptable amounts for changes in Contract Sum and Contract Time, a Contract Change Order shall be executed for these amounts.
 - 5) District shall have the right to audit Contractor's invoices and bid quotations to substantiate costs for Contract Change Orders.

- K. Construction Changes Based on Stipulated Sum or Time: Based on the Contractor's response to a Request for Proposal or Construction Change Directive, the District and Architect will review the response.
 - 1. The District and Contractor shall negotiate a mutually acceptable adjustment in Contract Sum and Contract Time, as appropriate, prior to performance of the changed Work.
 - 2. A Contract Change Order for the stipulated amounts shall be prepared based on the stipulated sum and change in time.
- L. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
 - 1. When agreement is reached on changes, if any, in the Contract Time and the Contract Sum, the Contractor shall prepare a Contract Change Order using a form as directed by the District, with supplementary documents as necessary to describe the change and the associated costs and schedule impacts.
 - 2. Construction Change Document approval is required from DSA prior to fabrication and installation.
 - 3. Submit Contract Change Orders to District through the Architect.
 - 4. Contractor shall prepare and submit five original sets of documents for each Change Order. District, Architect and Construction Manager shall sign the Change Order indicating acceptance and approval of the change.
 - a. Structural Engineer shall also sign the Change Order, when applicable.
 - 5. All Change Orders must be approved by DSA prior to fabrication and installation.
 - 6. Upon approval of the Change Order, Contractor shall promptly execute the change in the Work.
- M. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- N. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
 - 1. Contractor shall submit revised schedules at the next Application for Payment following approval and acceptance of the Contract Change Order.
- O. Promptly enter changes in Project Record Documents.

1.07 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Division 00 - Procurement and Contracting Requirements: Restrictions on timing of substitution requests.
- B. Section 00 43 25 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).
- C. Section 00 63 25 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- F. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Requests by Contractor to deviate from specified requirements for products, materials, equipment, and methods, or to provide products other than those specified, shall be considered requests for substitutions except under the following conditions:
 - 1. Substitutions are requested during the bidding period, and accepted prior to execution of the Contract. Acceptance shall be in the form of written Addendum to the Bidding

- documents or revision to the Drawings or Specifications for use as Construction Contract Documents.
2. Changes in products, materials, equipment, and methods of construction are directed by the District or Architect.
 3. Contractor options for provision of products and construction methods are specifically stated in the Contract Documents.
 4. Change in products, materials, equipment, and methods of construction is required for compliance with Codes, ordinances, regulations, orders and standards of authorities having jurisdiction.
- B. Substitution Provisions: Refer to substitution provisions of the Conditions of the Contract, in addition to the requirements specified herein. Provisions for consideration and acceptance of substitutions shall be as follows:
1. Documentation:
 - a. Substitutions will not be considered if they are indicated or implied on shop drawing, product data or sample submittals.
 - b. All requests for substitution shall be made by separate written request from Contractor.
 2. Cost and Time Considerations: Substitutions will not be considered unless a net reduction in Contract Sum or Contract Time results to the District's benefit, including redesign costs, life cycle costs, changes in related Work and overall performance of building systems.
 3. Design Revision:
 - a. Substitutions will not be considered if acceptance will require substantial revision of the Contract Documents or will substantially change the intent of the design, in the opinion of the Architect.
 - b. The intent of the design shall include functional performance and aesthetic qualities.
 4. Data: It shall be the responsibility of the Contractor to provide adequate data demonstrating the merits of the proposed substitution, including cost data and information regarding changes in related Work.
 5. Determination by Architect:
 - a. Architect will determine the acceptability of proposed substitutions and will notify Contractor, in writing within a reasonable time, of acceptance or rejection.
 - b. The determination by the Architect regarding functional performance and aesthetic quality shall be final.
 6. Non-Acceptance: If a proposed substitution is not accepted, provide the specified product.
 - a. If, in the opinion of the Architect, the substitution request is incomplete or has insufficient data to enable a full and thorough review of the intended substitution, the substitution may be summarily refused and determined to be unacceptable.
 7. Substitution Limitation: Only one request for substitution will be considered for each product.

- C. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - a. Include a signed certification that the Contractor has:
 - 1) Reviewed the proposed substitution and has determined that the substitution is equivalent or superior in every respect to product requirements indicated or product specified in the Contract Documents.
 - 2) Certify the proposed substitution is suited for and can perform the purpose or application of the specified product indicated or specified in the Contract Documents.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to District.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - a. Include a signed waiver by the Contractor for changes in the Contract Time or Contract Sum because of the following:
 - 1) Substitution failed to perform adequately.
 - 2) Substitution required changes in on other elements of the Work.
 - 3) Substitution caused problems in interfacing with other elements of the Work.
 - 4) Substitution was determined to be unacceptable by authorities having jurisdiction.
 - 6. Agrees to reimburse District and Architect for review or redesign services associated with re-approval by authorities.
- D. A Substitution Request for specified installer constitutes a representation that the submitter:
 - 1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- F. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated and included in the Project Manual are adequate for this purpose, and must be used.
 - 2. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) District's, Architect's, and Contractor's names.

- b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
 - 9) Include a detailed description, in written or graphic form as appropriate, indicating all changes or modifications needed to other elements of the Work and to construction to be performed by the District and by others under separate Contract with District, that will be necessary if the proposed substitution is accepted.
 - d. Impact of Substitution:
 - 1) Savings to District for accepting substitution.
 - (a) Include detailed cost data, including a proposal for the net change, if any, in the Contract Sum.
 - 2) Change to Contract Time due to accepting substitution.
 - (a) Indicate the substitution's effect on the Construction Schedule. Indicate the effect of the proposed substitution on overall Contract Time and, as applicable, on completion of portions of the Work for use by District or for work under separate contract by District.
- G. Limit each request to a single proposed substitution item.
- 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- B. Pursuant to Section 3400 of the Public Contract Code, requests for substitution will be considered only if received up to 7 days prior to the bid date. Subsequent requests will be considered only in the case of product unavailability, through no fault of the Contractor , or for reasons of cost reducing value analysis requested by the District .
- C. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing the form in Section 00 43 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing the form in Section 00 63 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. After Contract award, requests will be considered for cause only; in the case of product unavailability, through no fault of the Contractor , or for reasons of cost reducing value analysis requested by the District.
 - 1. Substitutions will be considered when a product, through no fault of the Contractor, becomes unavailable or unsuitable due to regulatory change.
 - 2. Product Availability Waiver:
 - a. Substitutions will be considered after 35 day time limit only when a product becomes unavailable due to no fault of Contractor.
 - b. Failure to place orders for specified products sufficiently in advance of required date for incorporation into the Work will not be considered as a valid reason for which Contractor may request a substitution or deviation from requirements of the Drawings and Specifications.
 - 3. Waiver: At the discretion of the District, limitations on substitutions may be waived.
- C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the District through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:

- a. District's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
 - b. Other construction by District.
 - c. Other unanticipated project considerations.
- E. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 CONTRACT DOCUMENT REVISIONS:

- A. Should a Contractor-proposed substitution or alternative sequence or method of construction require revision of the Contract Drawings or Specifications;
 - 1. Including revisions for the purposes of determining feasibility, scope or cost, or revisions for the purpose of obtaining review and approval by authorities having jurisdiction.
 - 2. Revisions will be made by Architect or other consultant of District who is the responsible design professional, as approved in advance by District.
- B. Services of Architect or other consultant of the District, including time spent in researching and reporting on proposed substitutions or alternative sequence and method of construction, shall be paid by Contractor when such activities are considered additional services to the design services contracts of the Architect or other responsible design professional with the District.
- C. Costs of services by Architect or other responsible design professional of the District shall be paid on a time and materials basis, based on current hourly fee schedules, with reproduction, long distance telephone and shipping costs reimbursable at cost plus usual and customary mark-up for handling and billing.
- D. Such fees shall be paid whether or not the proposed substitution or alternative sequence or method of construction is ultimately accepted by District and a Change Order is executed.
- E. Such fees shall be paid from Contractor's portion of savings, if a net reduction in Contract Sum results. If fees exceed Contractor's portion of net reduction, Contractor shall pay all remaining fees unless otherwise agreed in advance by the District.
- F. Such fees owed shall be deducted from the amount owed Contractor on the Application for Payment next made following completion of revised Contract Drawings and Specifications or completion of research and other services. District will then pay Architect or other consultant of the District.
- G. Certain substitutions require approval from DSA.

3.05 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.06 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.08 ATTACHMENTS

- A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Construction progress schedule.
- G. Contractor's daily reports.
- H. Progress photographs.
- I. Coordination drawings.
- J. Submittals for review, information, and project closeout.
- K. Number of copies of submittals.
- L. Requests for Interpretation or Information (RFI) procedures.
- M. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: General product requirements.
- B. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- D. Technical Product Sections: Procedures for specific submittals specified in those Sections to be made at Contract closeout.

1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires responsive action by Construction Manager and Architect or other responsible design professional.
- B. Informational Submittals: Written information that does not require responsive action by Construction Manager and Architect or other responsible design professional.
- C. Unsolicited Submittals: Action or informational submittals not required by the Contract Documents or not requested by the reviewer. Unsolicited submittals may be returned with notation "not reviewed."
- D. Product Data: Standard published information ("catalog cuts") and specially prepared data for the Work of the Contract, including standard illustrations, schedules, brochures, diagrams, performance charts, instructions and other information to illustrate a portion of the Work.

- E. Request for Interpretation or Information (RFI): A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as an RFI.
- F. Samples: Physical examples that demonstrate the materials, finishes, features, workmanship and other characteristics of a portion of the Work. Accepted samples shall serve as quality basis for evaluating the Work.
- G. Shop Drawings, Product Data and Samples: Instruments prepared and submitted by Contractor, for Contractor's benefit, to communicate to Architect the Contractor's understanding of the design intent, for review and comment by Architect on the conformance of the submitted information to the general intent of the design. Shop drawings, product data and samples are not Contract Documents.
- H. Shop Drawings: Drawings, diagrams, schedules and illustrations, with related notes, specially prepared for the Work of the Contract, to illustrate a portion of the Work.
- I. Other Submittals: Technical data, test reports, calculations, surveys, certifications, special warranties and guarantees, operation and maintenance data, extra stock and other submitted information and products shall not be considered as Contract Documents but shall be information from Contractor to Architect to illustrate a portion of the Work for confirmation of understanding of design intent.

1.04 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for material delivery access, traffic, and parking facilities.
 - 1. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation or Information.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.

8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation or Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format.
 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Unless specifically requested, paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: The selected service is:
 1. Bluebeam Software Inc.; Bluebeam Revu Studio: www.bluebeam.com.
 2. Other Service acceptable to both District and Architect.
 - a. Direct email with PDF copies.
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

1. Representatives of District are scheduled and included in this training.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for District.

3.02 PRECONSTRUCTION MEETING

- A. District will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. District.
 2. Architect.
 3. Contractor.
- C. Agenda:
 1. Execution of District-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of initial Submittal schedule.
 6. Designation of personnel representing the parties to Contract and Architect.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 1. Contractor.
 2. District.
 3. Architect.
 4. Construction Manager.
 5. Contractor's superintendent.
 6. Major subcontractors.
 7. Project Inspector of Record.
 8. DSA Field Representative.
- C. Agenda:
 1. Distribute and discuss list of subcontractors and suppliers.
 2. Project Communication Procedures: Review requirements and administrative requirements for written and oral communications.

- a. Review requirements and administrative procedures Contractor may wish to institute for identification and reporting purposes.
- 3. Change Procedures: Review requirements and administrative procedures for Change Orders, Construction Change Directives, Architect's supplemental instructions and Contractor's Requests for Interpretation or Information.
- 4. Use of premises by District and Contractor.
 - a. Site access restrictions, if any, and requirements to avoid disruption of operations at adjoining facilities or operations.
 - b. Construction Facilities and Temporary Utilities: Designate storage and staging areas, construction office areas; review temporary utility provisions; present District's requirements for use of premises.
- 5. District's requirements.
- 6. Construction facilities and controls provided by District.
- 7. Temporary utilities provided by District.
- 8. Survey and building layout.
- 9. Security and housekeeping procedures.
- 10. Schedules.
 - a. Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work;
 - b. Include coordination of District Furnished / Contractor Installed (OFCl) products;
- 11. Application for payment procedures.
- 12. Procedures for testing.
- 13. Procedures for maintaining record documents.
- 14. Requirements for start-up of equipment.
- 15. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.
- C. Special Meetings: As necessary, Construction Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.
 - 1. See Section 01 70 00 - Execution and Closeout Requirements.
- D. Attendance Required:
 - 1. Contractor.
 - 2. District.
 - 3. Architect.

4. Construction Manager.
 5. Contractor's superintendent.
 6. Major subcontractors.
- E. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 - a. Develop corrective measures and procedures, including but not necessarily limited to additional personnel loading to regain planned schedule.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- F. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, District, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and Construction Manager's review.
- B. Reviews by Architect and Construction Manager will be to ascertain the general status of construction and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.

3.06 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to District and Architect, submit two printed copies at weekly intervals.
 1. Submit in format acceptable to District.
 2. Submit using required form, a sample of which is appended to this section.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. List of separate contractors at Project site.
5. Approximate count of personnel at Project site.
 - a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, and helpers.
6. Major equipment at Project site.
7. Material deliveries.
8. Safety, environmental, or industrial relations incidents.
9. Meetings and significant decisions.
10. Unusual events (submit a separate special report).
11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
15. Change Orders received and implemented.
16. Testing and/or inspections performed.
17. List of verbal instruction given by District and/or Architect.
18. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Structural framing in progress and upon completion.
 5. Enclosure of building, upon completion.
 6. Final completion, minimum of ten (10) photos.

- F. Take photographs as evidence of existing project conditions as follows:
 - 1. Interior views: each elevation, floor and ceilings prior to demolition.
 - 2. Exterior views: each elevation, roof and areas adjacent to construction limits.
- G. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 - 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
 - 4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 - 5. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.09 REQUESTS FOR INTERPRETATION OR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
 - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
 - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 - 2. Prepare in a format and with content acceptable to District.
 - 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 - a. Submit RFIs from subcontractors and material suppliers through, be reviewed by and be attached to an RFI prepared, signed and submitted by Contractor.
 - 1) RFIs from subcontractors and material suppliers are to be:
 - (a) Reviewed by Contractor.
 - (b) Corrected and rewritten to clarify as required by Contractor.
 - (c) Placed on the proper form, then signed, and submitted by Contractor.
 - (d) RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the Contractor.
 - 2) RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the Contractor.
 - b. Review all subcontractor- and supplier-initiated RFIs and take actions to resolve issues of coordination, sequencing and layout of the Work.
 - 1) RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without response.
 - (a) Such issues are solely the Contractor's responsibility.
 - 2) Contractor is responsible for delays resulting from the necessity to resubmit an RFI due to insufficient or incorrect information presented in the RFI.
 - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 - 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The District reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. District's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 - a. Inability to determine from the Contract Documents the exact material, process, or system to be installed;
 - b. Or when the elements of construction are required to occupy the same space (interference);
 - c. Or when an item of Work is described differently at more than one place in the Contract Documents.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
 - a. In all cases, furnish all information required for the Architect to analyze and/or understand the circumstances causing the RFI and prepare a clarification or direction as to proceed for RFIs issued to request clarification of issues related to:
 - 1) Means, methods, techniques and sequences of construction, for example
 - 2) Pipe and duct routing, clearances;
 - 3) Specific locations of Work shown diagrammatically;
 - 4) Apparent interferences and similar items.
 - 5) If information included with this type RFI by the Contractor is insufficient, the RFI will be returned unanswered.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.

3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to District.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.10 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule.
 - a. Submit initial Submittals Schedule within 14 days of date of Notice of Award of construction.
 - b. After review and return by Architect, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.
 - c. Submit one copy each to Owner and Architect.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - a. Prepare schedules in Gantt format using software at Contractor's option, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
 - 1) Submittals shall be connected to the related construction element by a graphically indicated critical path on the same page.

- 2) Present schedules using opaque reproductions on substantial paper, with sheet size a multiple of 8-1/2 by 11 inches and large enough to clearly read characters.
4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

3.11 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.12 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for District.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.

- a. Include operation and maintenance data submittals in Submittals Schedule specified above.
 - b. Provide space for review action stamps and, if required by governing authorities having jurisdiction, license seal of design Professional, if applicable.
- 3. Warranties.
- 4. Bonds.
- 5. Other types as indicated.
- D. Submit for District's benefit during and after project completion.

3.14 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format with renderable text; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Small Size Sheets, Not Larger Than 11 by 17 inch: Submit one copy; the Contractor shall make his own copies from original returned by the Architect after making his own file copy.
- C. Extra Copies at Project Closeout: See Section 01 78 00.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.
 - 3. Quantity:
 - a. Submit minimum of four (4) samples of each of color, texture and pattern.
 - b. Submit one item only of actual assembly or product.
 - c. Unless otherwise noted, full-size and complete samples will be returned and may be incorporated into field mock-ups and the Work.

3.15 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - a. For example:
 - 1) 09 21 16-1 - First submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - 2) 09 21 16-2 - Second submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - b. Use same number for resubmittals as original submittal, followed by a letter indicating sequential resubmittal. For example:

- 1) 09 21 16-2A - Resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - 2) 09 21 16-2B - Second resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - b. Field measurements have been determined and verified.
 - c. Conformance with requirements of Contract Drawings and Specifications is confirmed.
 - d. Catalog numbers and similar data are correct.
 - e. Work being performed by various subcontractors and trades is coordinated.
 - f. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for District and actual site conditions.
 - g. All deviations from requirements of Drawings and Specifications have been identified and noted.
7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Send submittals in electronic format via email to Architect.
 - b. Upload submittals in electronic form to Electronic Document Submittal Service website.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, District, or another affected party, allow an additional 7 days.
9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - a. Changes in the Work shall not be authorized by submittals review actions.
 - b. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - c. Changes shall only be authorized by separate written Contract Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
10. Provide space for Contractor and Architect review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 14. Submittals not requested will be recognized, but will be returned without comment,
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal.
 4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Use of reproductions of Contract Documents in digital data form to create shop drawings is only permitted as defined in Division 01 and individual product sections.
 3. Coordination: Show all field dimensions and relationships to adjacent or critical features of Work.
 4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Samples will be reviewed for aesthetic, color, or finish selection.
 3. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 4. Color Selection Samples: Architect will review and select colors for Project only after all colors are received, so that colors may be properly coordinated.
 5. Copies: Submit actual samples. Photographic or printed reproductions will not be accepted.
 6. Review of Field Samples: Review by Architect of field samples will be made for the following example products, as applicable, if not otherwise required and if requested by Contractor.
 - a. Concrete wall finishes and detailing (edges, corners and reveals).
 - b. Concrete paving colors and textures.
 - c. Gypsum board textures and finishes.
 - d. Field-applied paint colors and finishes.

3.16 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 - 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 - 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - 2) Non-responsive resubmittals may be rejected.
 - 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
 - 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 30 00.01
REQUEST FOR INTERPRETATION

RFI NUMBER: _____

DATE: _____

PROJECT NAME: FOOTHILLS ADULT EDUCATION CENTER

PROJECT NO.: 1-30-47

TO: RUHNAU CLARKE ARCHITECTS

. 5751 Palmer Way, Suite C, Carlsbad CA 92010

Attention: _____

Contractor: _____

Address: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

. Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

SUGGESTED SOLUTION: _____

Response required by: _____ (min. 3 full days) Submitted By: _____

. Organization: _____

RESPONSE: _____

Attachments: _____

Response By: _____ Date: _____

Organization: _____

Copies: __ File __ District __ Structural __ Mechanical __ Plumbing __ Electrical
__ Civil __ Landscape __ other consultants

END OF RFI



SUBMITTAL / SHOP DRAWING TRANSMITTAL

To:	Ruhnau Clarke Architects	Contractor's Submittal No.	
Attn:	Construction Dept.		
Contractor:		Project Name:	Foothills Education Center
Street:		RCA's Project No.	1-30-47
City, State:		Subcontractor:	

CONTRACTOR TO FILL OUT THE FOLLOWING COVERING ONE COMPLETE SECTION OF THE SPECIFICATIONS ONLY:

Specification Section #:	Section Title:

☐	Initial Submittal	Scheduled Date of Submittal	
☐	1st Resubmittal	Scheduled Date of Submittal Return	
☐	___ Resubmittal	Date Sent	
☐	Submittal was a previously approved substitution.	Number of Copies	
	Approved Substitution Request Transmittal Form is enclosed.	Number of Samples	

CONTRACTOR COMPLETE EITHER (A) OR (B) FOLLOWING, <u>CHECK ONE</u> :		CONSTRUCTION MANAGERS CERTIFICATION	
(A)	WE HAVE VERIFIED THAT THE MATERIAL OR EQUIPMENT CONTAINED IN THIS SUBMITTAL MEETS ALL THE REQUIREMENTS SPECIFIED OR SHOWN (NO EXCEPTIONS).	THIS IS TO CERTIFY THAT THE CONSTRUCTION MANAGER IS REASONABLY CERTAIN THAT THE MATERIAL SPECIFIED IN THIS SUBMITTAL MEETS THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, AND THE SUBMITTAL IS COMPLETE PER THE CONTRACT DOCUMENTS.	
	☐	SIGNATURE: _____	
(B)	WE HAVE VERIFIED THAT THE MATERIAL OR EQUIPMENT CONTAINED IN THIS SUBMITTAL MEETS ALL THE REQUIREMENTS SPECIFIED OR SHOWN, EXCEPT FOR THE FOLLOWING DEVIATIONS (LIST DEVIATIONS ON AN ATTACHED SHEET OR INDICATE DEVIATIONS CLEARLY ON SHOP DRAWINGS OR SUBMITTALS).	CONTRACTORS CERTIFICATION	
	☐	THIS IS TO CERTIFY THAT THE CONTRACTOR IS REASONABLY CERTAIN THAT THE MATERIAL SPECIFIED IN THIS SUBMITTAL MEETS THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.	
		SIGNATURE: _____	

ARCHITECT'S USE ONLY BELOW THIS LINE.

Action:

☐ No Exception Taken ☐ Make Corrections Noted ☐ Rejected/Resubmit ☐ Revise and Resubmit

Comments:

Date Received By RRC:

Date Sent to Consultant:

Structural _____

Mechanical _____

Electrical _____

Other _____

Date Received From:

Consultant _____

No. of Copies Received _____

Final Distribution: Contractor _____ Inspector _____ District/P.M. _____ Architect _____

Final Distribution Date: _____

SECTION 01 31 14
FACILITY SERVICES COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Services of a coordinator for facility services construction.
- B. Coordination documents.
 - 1. BIM Coordination drawings for the various trades of this project.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Responsibilities of separate contractors.
 - 1. Various types of Work to be coordinated, including Owner-Furnished / Contractor-Installed products.
- B. Section 01 30 00 - Administrative Requirements: Additional requirements for coordination.
- C. Section 01 60 00 - Product Requirements: Spare parts and maintenance materials.
 - 1. Coordination of products, especially general requirements for system completeness and product substitutions.
- D. Section 01 70 00 - Execution and Closeout Requirements: Starting of Systems. Systems Demonstration.
- E. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 MECHANICAL AND ELECTRICAL COORDINATOR

- A. Employ and pay for services of a person, technically qualified and administratively experienced in field coordination of the type of work required to be coordinated, for the duration of the Work.
 - 1. This designated individual may serve a dual role on the project team.

1.04 SUBMITTALS

- A. Submit name, address, and telephone number of coordinator and name of principal officer for review.
- B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. Coordinate the Work as stated in the Conditions of the Contract.
 - 1. Coordinate Work under the Contract with work under separate contracts by District.

2. Preinstallation Meetings: Coordinate and document work between trades. See Section 01 70 00 - Execution and Closeout Requirements.
 3. Cooperate with District, Construction Manager, and others as directed by District in scheduling and sequencing the incorporation into the Work of Owner Furnished / Contractor Installed (OFICI) products identified in the Contract Drawings and Specifications.
- B. Relationship of Documents:
1. Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary.
 2. What is required by one shall be as if required by all.
 3. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.
- C. Discrepancies:
1. Error, omission, ambiguity or conflict in Drawings or Specifications shall be brought to Architect's attention during the bidding period, for Architect's determination and direction in accordance with provisions of the Conditions of the Contract.
- D. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.
1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.
- E. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and interpretation of all elements of the Work.
1. All work required to provide complete and fully operational systems shall be included in the contract price.
 2. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by District, utility agencies and companies.
- F. Coordinate the work listed below:
1. Structural: Division 03, Division 05, and Division 06.
 2. Architectural: Division 7, Division 8, Division 9, and Division 12.
 3. Specialties: Division 10.
 4. Equipment: Division 11.
 5. Fire Suppression: Division 21.
 6. Plumbing: Division 22.
 7. Heating, Ventilating, and Air Conditioning: Division 23.
 8. Electrical: Division 26.
 9. Communications: Division 27.
 10. Electronic Safety and Security: Division 28.
- G. Coordinate progress schedules, including dates for submittals and for delivery of products.

- H. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- I. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- J. Coordination of subcontracts and separate contracts
 - 1. Superintendence of Work:
 - a. Contractor shall appoint a field superintendent and a project manager, who shall directly and full time supervise and coordinate all Work of the Contract.
 - 2. Subcontractors, Trades and Materials Suppliers:
 - a. Require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Contractor's field superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.
 - 3. Coordination with Work Under Separate Contracts:
 - a. Coordinate and schedule Work under the Contract with work being performed for Project under separate contracts by District, serving utilities and public agencies.
 - b. Make and facilitate direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.

3.02 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
 - 1. Produce BIM Drawings for the proposed installation and the placement of pipes, conduits, other materials, and the locations, size and reinforcement of penetrations in the building structure to conform to the structural Drawing and Specifications.
 - 2. Structural requirements take precedence when the requirements of the Mechanical, Electrical or other items are in conflict with structural.
 - 3. Take all precautions prior to coring into an existing building structure.
 - 4. Notify the structural engineer and obtain written approval prior to completing any structural penetrations if the structural integrity of an existing or new building structure may be compromised. Refer to Section 01 70 00 - Execution and Closeout Requirements for cutting and patching.
 - 5. Review limitations in available space for installation or service.
 - a. Overlay plans of each trade and verify space requirements and conflicts between trades.
 - b. Minor changes and adjustments that do not affect design intent may be made by Contractor and highlighted for Architect's review prior to purchase and installation.
 - 6. Incompatibility between items provided under different trades.
 - 7. Inconsistencies between drawings, specifications and codes (between trades and within each trade).

- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- C. Verify that utility, and other building system requirement characteristics of operating equipment are compatible with provided utilities, and other building systems.
 - 1. Coordinate work of various trades having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Identify electrical power characteristics and control wiring required for each item of equipment.
- E. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- F. After Architect review of original and revised documents, reproduce and distribute copies to concerned parties.

3.03 COORDINATION DRAWINGS / BIM MODEL

- A. Building Information Modeling (BIM) is required for this Project, such as 3-D Clash Coordination. Submit a BIM Project Execution Plan for Program Project Manager and Design Professional review. The plan shall at minimum include the following items.
 - 1. Project Goals/ BIM uses and Objectives: Clear objective and goals. Align objectives with Construction Documents and Agreement.
 - 2. Project Information: Provide key project contacts including project name, contract type, delivery method, project description, project schedule, phases, and milestones.
 - a. Key Project Contacts:
 - 1) Project Managers.
 - 2) BIM Manager.
 - 3) Trade BIM Managers.
 - 4) Superintendents and other major project roles.
 - b. BIM and Trade BIM Managers must have at least two years of BIM experience of similar size projects.
 - c. Organizational Roles and Staffing: Define roles in each organization and specific responsibilities.
 - 3. BIM Information Exchanges:
 - a. Identify the information exchanges created as part of the planning process in the BIM Project Execution Plan.
 - b. Information exchanges are to illustrate the model elements by discipline, level of detail, and any specific attributes important to the project.
 - 4. Collaboration Procedures:
 - a. Develop Team electronic and activity collaboration procedures.
 - b. Includes model management and standard meeting actions and agendas.
 - 5. Quality Control: Project teams should determine and document their overall strategy for quality control of the model.
 - 6. Model Structure: The team must identify the methods to ensure model accuracy and comprehensiveness.

7. Project Deliverables: Identify project deliverables as required by Construction Manager.
8. Field Execution of final BIM product: Outline how the final BIM deliverables will be executed to reduce construction errors, change orders, and trade scheduling issues.

3.04 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.
- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.

3.05 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- C. Submit with recommendation for action.

3.06 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.07 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 1. Specification section number and product name.
 2. Name of Contractor, subcontractor, and special inspector.
 3. Name of testing agency and name of inspector.
 4. Name of manufacturer's representative present.
 5. Date, time, and duration of tests.
 6. Type of test, and results.
 7. Retesting required.
- B. Assemble background documentation for dispute and claim settlement.
- C. Submit copies of documentation to Architect upon request.

3.08 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.

- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
- C. Observe equipment demonstrations made to District; record times and additional information required for operation and maintenance manuals.

3.09 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
- B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 40 00 QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contractor Quality assurance submittals.
- B. Quality assurance.
- C. Testing and inspection agencies and services.
- D. Contractor's construction-related professional design services.
- E. Control of installation.
- F. Mock-ups.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 41 00 - Regulatory Requirements: Compliance with applicable codes, ordinances and standards.
- C. Section 01 42 19 - Reference Standards.
- D. Section 01 45 33 - Code-Required Special Inspections: Testing laboratory services and inspections required by Division of the State Architect (DSA), during the course of construction.
- E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.
 - 1. Product options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

1.03 REFERENCE STANDARDS

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.04 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.

2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary falsework for support of spanning or arched structures.
5. Temporary stairs or steps required for construction access only.
6. Temporary hoist(s) and rigging.
7. Investigation of soil conditions to support construction equipment.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for District's information.
 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Quality Control Submittals Schedule
 1. Schedule Format: Include quality control submittals on Submittals Schedule specified in accordance with General Conditions
 2. Schedule Content: List all tests, inspections and reports specified to be submitted, indicating submittal number, submittal type (field test, field inspection, fabrication inspection, etcetera), scheduled date of quality control activity and date report should be made.
- D. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for District's information.
 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 2. Include required product data and shop drawings.
 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- E. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.

- d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
- 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for District's information.
- F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- G. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the District's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- H. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for District.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- I. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for District.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or District.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Qualification Statement: Provide documentation showing testing laboratory is approved by Division of the State Architect.
 4. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in California.
- C. Contractor's Quality Control (CQC) Plan:
1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.
 - c. District will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
 - d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. District's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. District reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.08 REFERENCES AND STANDARDS - SEE SECTION 01 42 19

1.09 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

- A. Inspections, testing and approvals as required by authorities having jurisdiction. Refer to Section 01 41 00 - Regulatory Requirements and Section 01 45 33 - Code-Required Special Inspections.
- B. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting and finishing Work.
- C. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. District will employ and pay for services of an independent testing agency approved by DSA to perform specified testing.
- B. As indicated in individual specification sections, District or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 - 1. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 2. Laboratory: Authorized to operate in California.
 - 3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTRACTOR'S QUALITY ASSURANCE

- A. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Drawings and Specifications, including, by reference, all Codes, laws, rules, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for projects of this type.

- B. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

3.02 CONTROL OF INSTALLATION

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.
- B. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- C. Comply with manufacturers' instructions, including each step in sequence.
- D. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- E. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- F. Have work performed by persons qualified to produce required and specified quality.
- G. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.
- I. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.
- J. Protection of Existing and Completed Work: Take all measures necessary to preserve and protect existing and completed Work free from damage, deterioration, soiling and staining, until Acceptance by the District.
- K. Verification of Quality: Work shall be subject to verification of quality by District, or Architect in accordance with provisions of the General Conditions of the Contract.
 - 1. Contractor shall cooperate by making Work available for inspection by District, Architect or their designated representatives.
 - 2. Such verification may include mill, plant, shop, or field inspection as required.
 - 3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
 - 4. Provide all information and assistance as required, including that by and from subcontractors, installers, fabricators, materials suppliers and manufacturers, for verification of quality by District, or Architect.
 - 5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Conditions.

3.03 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.
- J. Where possible salvage and recycle the demolished mock-up materials.

3.04 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.05 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 7. Inspections and Tests by Authorities Having Jurisdiction:
 - a. Contractor shall cause all tests and inspections to be made for Work under this Contract, as required by Building Departments, Department of Public Works, Fire Department, Health Department and similar agencies having jurisdiction.
 - b. Excepted as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
 8. Inspections and Tests by Serving Utilities:
 - a. Contractor shall cause all tests and inspections required by serving utilities to be made for Work under this Contract.
 - b. Scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.06 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of

surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of District.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.07 FIELD QUALITY CONTROL SUBMITTALS

- A. Administration: Make all submittals to the Architect, unless otherwise directed.
- B. Submittal Identification: Identify each submittal by Specification Section number followed by a number indicating sequential submittal for that Section. Coordinate submittal numbers with submittals specified in Section 01 30 00 - Administrative Requirements.
 - 1. Resubmittals shall use same number as original submittal, followed by a letter indicating sequential resubmittal.

03 30 00 - 1	First submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2	Second submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2A	Resubmittal of second submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2B	Second resubmittal of second submittal for Section 03 30 00 - Cast in Place Concrete.

- C. Project Identification: Title each submittal with Project name, submittal date and Architect's Project number.
- D. Copies: Provide PDF copies electronically transmitted or submit 6 copies, minimum, of reports of quality control reports on dry-process xerographic copies only.
- E. Contractor's Review:
 - 1. Submittals shall be made in accordance with requirements specified herein and in individual Sections.
 - 2. Indicate clearly on each submittal the specified or referenced values for each quality control activity and the values obtained.
 - 3. Note clearly and sign each submittal certifying that reported quality control activity "Conforms" or "Does Not Conform".
- F. Changes and Deviations:
 - 1. Identify all deviations from requirements of Drawings and Specifications.
 - 2. Changes in the Work shall not be authorized by submittals review actions.
 - 3. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - 4. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the General Conditions and 01 20 00 - Price and Payment Procedures.

- G. Record Submittals: When record submittals are specified, submit three copies or sets only. Record submittals will not be reviewed but will be retained for historical and maintenance purposes.
- H. Unsolicited Submittals: Unsolicited submittals will be returned unreviewed.

3.08 ARCHITECT'S REVIEW

- A. General:
 - 1. Submitted Report review by Architect and Architect's consultants shall be only for general conformance with the design concept and requirements based on the information presented.
 - 2. Neither Architect nor Architect's consultants shall verify submitted quality control data.
- B. Contract Requirements:
 - 1. Review by Architect and Architect's consultants shall not relieve the Contractor from compliance with requirements of the Drawings and Specifications.
 - 2. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the General Conditions and 01 20 00 - Price and Payment Procedures.
- C. Observations by Architect and Architect's Consultants: Periodic and occasional observations of Work in progress will be made by Architect and Architect's consultants as deemed necessary to review progress of Work and general conformance with design intent.

3.09 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements, at no change in Contract Sum or Contract Time.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.
- C. Architect's Acceptance and Rejection of Work: Architect reserves the right to reject all Work not in conformance to the requirements of the Drawings and Specifications.
- D. Acceptance of Non-Conforming Work: Acceptance of non-conforming Work, without specific written acknowledgement and approval of the District, shall not relieve the Contractor of the obligation to correct such Work.
 - 1. Acceptance of structurally related non-conforming work shall be submitted to DSA for review and approval.
- E. Contract Adjustment for Non-conforming Work:
 - 1. Should Architect or District determine that it is not feasible or in District's interest to require non-conforming Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between District and Contractor.
 - 2. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of the General Conditions.

- F. Non-Responsibility for Non-Conforming Work: Architect and Architect's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications.

END OF SECTION

SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS

- A. Authority: All codes, ordinances and standards referenced in the Drawings and Specifications shall have the full force and effect as though printed in their entirety in the Specifications.
- B. Precedence:
 - 1. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements take precedence.
 - 2. Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, the Drawings and Specifications take precedence so long as such increase is legal.
 - 3. Where no requirements are identified in the Drawings or Specifications, comply with all requirements of applicable codes, ordinances and standards of authorities having jurisdiction.
- C. Applicable Codes, Laws and Ordinances: Refer also to Section 01 10 00 - Summary, regarding permits and licenses.
 - 1. Performance of the Work is be governed by all applicable laws, ordinances, rules and regulations of Federal, State and local governmental agencies and jurisdictions having authority over the Project, including accessibility requirements.
 - 2. Performance of the Work shall be accomplished in conformance with all rules and regulations of public utilities, utility districts and other agencies serving the development.
 - 3. Where such laws, ordinances, rules and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Sum, except where changes in laws, ordinances, rules and regulations occur subsequent to the execution date of the Agreement.
- D. Applicable Building Codes: References on the Drawings or in the Specifications to "code" or "building code" not otherwise identified shall mean the codes specified below, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction having authority over the Project.
- E. Performance of the Work shall meet or exceed the minimum regulatory requirements applicable to this project are summarized in this section, as adopted by Division of the State Architect:
 - 1. Part 1, Title 24 CCR - 2019 California Building Standards Administrative Code.
 - 2. Part 2, Title 24 CCR - 2019 California Building Code (CBC); Volumes 1 and 2.
 - a. Based on ICC (IBC) - ICC International Building Code, 2018.
 - 3. Part 3, Title 24 CCR - 2019 California Electrical Code (CEC, NFPA 70-NEC 2017).

4. Part 4, Title 24 CCR - 2019 California Mechanical Code (CMC).
 - a. Based on IAPMO (UMC) - Uniform Mechanical Code, 2018.
5. Part 5, Title 24 CCR - 2019 California Plumbing Code (CPC).
 - a. Based on IAPMO (UPC) - Uniform Plumbing Code, 2018.
6. Part 6, Title 24 CCR - 2019 California Energy Code.
7. Part 9, Title 24 CCR - 2019 California Fire Code (CFC).
 - a. Based on ICC (IFC) - International Fire Code; 2018.
8. Part 11, Title 24 CCR - 2019 California Green Building Standards Code (CalGreen).
9. Part 12, Title 24 CCR - 2019 California Referenced Standards Code.

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. California Referenced Standards Code, 2019: Chapter 12-7-4 Fire Resistive Standards, for fire rated doors.
- C. National Fire Protection Association (NFPA): (Partial List of Applicable Standards)
 1. Reference CBC for applicable NFPA Standards - 2019 CBC (SFM) Chapter 35.
 2. NFPA 13 - Standard for the Installation of Sprinkler Systems (CA Amended); is current; use 2016, as amended in 2019 CBC Ch.35 Referenced Standards.
 3. NFPA 70 - National Electrical Code.
 - a. Use 2016 as indicated in 2019 CBC Ch.35 Referenced Standards.
 4. NFPA 72 - National Fire Alarm and Signaling Code (CA Amended) is current; use 2016 as amended in 2019 CBC Ch.35 Referenced Standards.
 5. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016 is current; use 2016 as indicated in 2019 CBC Ch.35 Referenced Standards.
 6. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and other Opening Protectives; 2016 is current; use 2016 as indicated in 2019 CBC Ch.35 Referenced Standards..
 7. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.
- D. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice.
- E. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice.
- F. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- G. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- H. 29 CFR 1910 - Occupational Safety and Health Standards.

1.03 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue specified in the individual specification sections, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 CALIFORNIA DEPARTMENT OF GENERAL SERVICES, DIVISION OF THE STATE ARCHITECT

2.01 INTERPRETATION OF REGULATIONS

- A. Document IR A-5 - Acceptance of Products, Materials, and Evaluations Reports; Revised 1-27-17 .
- B. Current listings are on the DGS website:
<http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx>.

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.01 CFR -- CODE OF FEDERAL REGULATIONS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content.
- C. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- D. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice.
- E. 29 CFR 1910 - Occupational Safety and Health Standards.

- F. 29 CFR 1910, Subpart D - Walking-Working Surfaces, 1910.21-1910.30.
- G. 29 CFR 1910.23 - Ladders.
- H. 29 CFR 1910.38 - Emergency action plans.
- I. 29 CFR 1910.132-138 - Personal Protective Equipment.
- J. 29 CFR 1910.134 - Respiratory protection.
- K. 29 CFR 1926.62 - Lead.
- L. 29 CFR 1926.1101 - Asbestos.
- M. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- N. 39 CFR 111 - U.S. Postal Service Standard 4C.
- O. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- P. 40 CFR 60 - Standards of Performance for New Stationary Sources.
- Q. 40 CFR 273 - Standards For Universal Waste Management.
- R. 40 CFR 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks.
- S. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions.
- T. 47 CFR 15 - Radio Frequency Devices.
- U. 47 CFR 68 - Connection of Terminal Equipment to the Telephone Network.
- V. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA).
- W. 49 CFR 178 - Specifications for Packaging.
- X. 49 CFR 192.285 - Plastic Pipe: Qualifying Persons to Make Joints.

3.02 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION

- A. CPSC Pub. No. 325 - Public Playground Safety Handbook.

3.03 EPA -- ENVIRONMENTAL PROTECTION AGENCY

- A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit.
- B. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- C. EPA 600-4-790-20 - Methods for Chemical Analysis of Water and Wastes.
- D. EPA 625/1-86/021 - Design Manual: Municipal Wastewater Disinfection.
- E. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.
- F. EPA 712-C-02-190 - Health Effects Test Guidelines OPPTS 870.1100 Acute Oral Toxicity.

3.04 FDA -- FOOD AND DRUG ADMINISTRATION

- A. FDA Food Code - Chapter 6 - Physical Facilities.

3.05 FEMA -- U.S. FEDERAL EMERGENCY MANAGEMENT AGENCY

- A. FEMA (MAPS) - FEMA Map Service Center.
- B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment.
- C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment.
- D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe.
- E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage.

3.06 FS -- FEDERAL SPECIFICATIONS AND STANDARDS (GENERAL SERVICES ADMINISTRATION)

- A. FED-STD-595C - Colors Used in Government Procurement (Fan Deck).
- B. FS L-F-001641 - Floor Covering Translucent or Transparent Vinyl Surface with Backing; 1971, and Amendment 2, 1982.
- C. FS L-S-125 - Screening, Insect, Nonmetallic.
- D. FS RR-P-1352 - Partitions, Toilet, Complete; Revision C, 1989.
- E. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant.
- F. FS RR-W-365 - Wire Fabric (Insect Screening); 1980, Rev. A (Amended 1986).
- G. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Revision B, 1974, and Amendment 1, 1979.
- H. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective.
- I. FS TT-P-115 - Paint, Traffic (Highway, White and Yellow); Revision F, 1984.
- J. FS TT-P-1952 - Paint, Traffic and Airfield Marking, Waterborne.
- K. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.
- L. FS W-C-596 - Connector, Electrical, Power, General Specification for.
- M. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification).
- N. STATE STD 01.01 - Certification Standard Forced Entry and Ballistic Resistance of Structural Systems; Physical Security Division, Office of Physical Security Programs, Bureau of Diplomatic Security, United States Department of State.
- O. UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings.
- P. USPS Handbook AS-503 - Standard Design Criteria; United States Postal Service.

3.07 GSA -- U.S. GENERAL SERVICES ADMINISTRATION

- A. GSA PBS-P100 - Facilities Standards for the Public Buildings Service; General Services Administration.

3.08 NIJ -- NATIONAL INSTITUTE OF JUSTICE (DEPT. OF JUSTICE)

- A. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials.

3.09 PS -- PRODUCT STANDARDS

- A. PS 1 - Structural Plywood.
- B. PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
- C. PS 20 - American Softwood Lumber Standard.

3.10 USDA -- UNITED STATES DEPARTMENT OF AGRICULTURE

- A. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service.

3.11 USGS -- UNITED STATES GEOLOGICAL SURVEY

- A. USGS (FMWQ) - National Field Manual for the Collection of Water-Quality Data; United States Geological Survey.

END OF SECTION

SECTION 01 45 33
CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Division of the State Architect (DSA) Procedures for construction oversight and inspections required during the course of construction.
- B. Code-required special inspections.
 - 1. Division of the State Architect (DSA) approved testing laboratory services and inspections required during the course of construction.
- C. Testing services incidental to special inspections.
- D. Submittals.
- E. Manufacturers' field services.
- F. Fabricators' field services.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements.
- C. Section 01 42 19 - Reference Standards.
- D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 ABBREVIATIONS AND ACRONYMS

- A. NIST: National Institute of Standards and Technology.

1.04 DEFINITIONS

- A. Code or Building Code: California Building Code and, more specifically, Chapter 17A - Structural Tests and Special Inspections, of same.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located. AHJ for this Project is Division of the State Architect.
- C. Special Inspection:
 - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the CBC that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
 - 2. Special inspections are separate from and independent of tests and inspections conducted by District or Contractor for the purposes of quality assurance and contract administration.

1.05 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- D. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
- E. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- F. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- G. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
- H. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- I. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- J. ASTM E2570/E2570M - Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage.
- K. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:
 - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Testing and inspections will be performed by an independent testing laboratory selected and employed by the District and approved by the Division of the State Architect (DSA).
 - a. Qualification of a testing agency or laboratory will be under the jurisdiction of the DSA Structural Safety Section (SSS). Procedural and acceptance criteria are set forth in the California Administrative Code (CBC) Chapter 4.
- D. Manufacturer's Qualification Statement: Manufacturer is required to submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.
- E. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures.
- F. Distribution List: The Testing Laboratory will make the following distribution of test and inspection reports:

1.	District	1
2.	Architect	2
3.	Structural Engineer	1
4.	Contractor	1
5.	District's Inspector	1
6.	Division of the State Architect	1
7.	Construction Manager	1
- G. Each and every test or inspection report shall bear the File Number and Application Number assigned to this project by the DSA.
- H. DSA Form 291: From the engineering manager of the laboratory of record.
- I. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of special inspection.
 - h. Date of special inspection.
 - i. Results of special inspection.
 - j. Compliance with Contract Documents.
 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
 3. Comply with DSA IR 17-12, revised 04/23/20.
- J. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of fabricated item and specification section.
 - f. Location in the Project.
 - g. Results of special inspection.
 - h. Verification of fabrication and quality control procedures.
 - i. Compliance with Contract Documents.

- j. Compliance with referenced standard(s).
- K. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one each to the distribution list.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test or inspection.
 - h. Date of test or inspection.
 - i. Results of test or inspection.
 - j. Compliance with Contract Documents.
 - k. Test reports shall be signed by a Civil Engineer licensed in the State of California.
 - 2. Test reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
 - a. Samples taken but not tested shall also be reported.
 - b. Records of special sampling operations as required shall also be reported.
 - c. Reports shall show that the material or materials were sampled and tested in accordance with the requirements of the CBC, and with the approved specifications.
 - d. They shall also state definitely whether or not the material or materials tested comply with requirements.
 - e. Test reports shall be issued within 14 days of finding being known, to all parties listed above.
 - 3. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
 - 4. Verification of Test Reports:
 - a. The Testing Laboratory of record shall submit to the Division of the State Architect (DSA) a verified report covering all tests which are required to be made by that agency during the progress of the project.
 - 1) Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project.
 - 2) Specific testing requirements as listed on the Structural Test and Inspections (T&I) Form DSA-103 for this project. These tests may include the following forms:
 - (a) DSA-201: Soils Compaction.
 - (b) DSA-202: Sieve Analysis.
 - (c) DSA-203: Tension/Bend.
 - (d) DSA-204: Compression.
 - (e) DSA-206: Anchor Load.

- (f) DSA-210: Ultrasonic (NDT).
 - (g) DSA-250: Special Inspection(s).
 - (h) DSA-291: Laboratory Verified Report.
 - (i) DSA-292: Special Inspection(s) Verified Report(s).
 - 3) Other Division of the State Architect (DSA) Certification Documents (Reports) as may be required.
- b. DSA Form 292 - Special Inspection Verified Report shall be from all special inspectors contracting directly and individually with the school board.
- L. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.
- M. Manufacturer's Field Reports: Submit reports to Architect.
 - 1. Submit report in duplicate within 7 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.
- N. Fabricator's Field Reports: Submit reports to Architect and AHJ.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

1.07 SPECIAL INSPECTION AGENCY

- A. District will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.08 TESTING AND INSPECTION AGENCIES

- A. District is to employ services of an independent inspection and testing agency to perform observation, testing and sampling associated with special inspections including those not required by the building code. CAC
 - 1. Project Inspector and testing lab are employed by the District and approved by:
 - a. A/E of Record.
 - b. Structural Engineer (when applicable).
 - c. DSA.

- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.09 QUALITY ASSURANCE

- A. Special Inspection Agency Qualifications:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
- B. Testing Agency Qualifications:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
- C. Testing and inspection services which are performed shall be in accordance with requirements of the CBC, and as specified herein. Testing and inspection services shall verify that work meets the requirements of the Construction Documents.
- D. In general, tests and inspections for structural materials shall include all items enumerated on the Structural Tests and Inspections list for this project as prepared and distributed by the Architect.
- E. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

1.10 INSPECTION BY THE DISTRICT

- A. The District shall have the right to reject materials and workmanship which are defective, or to require their correction.
 - 1. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the District.
 - 2. If the Contractor does not correct such rejected work within a reasonable time, the District may correct such rejected work and charge the expense to the Contractor.
- B. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work; the Contractor shall on request promptly furnish necessary facilities, labor and materials.
 - 1. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. .
 - 2. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

1.11 DISTRICT'S INSPECTOR

- A. A Project Inspector (IOR) employed by the District and approved by Architect, Structural Engineer and DSA in accordance with the requirements of the California Building Code will be assigned to the work.
 - 1. Project Inspector duties are specifically defined in CCR Title 24 Part 1, Sec. 4-211(b), 4-219, 4-333(b), 4-336 and 4-342.

- B. The District's Inspector shall at all times have access for the purpose of inspection to all parts of the work and to the shops where the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the District's Inspector.
 - 1. The Contractor shall furnish the 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.
 - 2. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.
 - 3. Inspector of Record is required to work a normal 40 hour week on this project only. Any overtime required will be at the expense of the Contractor and sub-contractor requiring the inspection.

1.12 PAYMENTS

- A. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid for by the District, providing such testing and inspection indicates compliance with Contract Documents. Initial tests and inspections are defined as the first tests and inspections as herein specified.
- B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and reinspection will be paid by the District and backcharged to the Contractor.
- C. Additional tests and inspections not herein specified but requested by District or Architect, will be paid for by District, unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as retesting and reinspection and backcharge the Contractor.
- D. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid by District and backcharged to the Contractor.
- E. Costs for tests or inspections which are required to correct deficiencies will be paid by the District and backcharged to the Contractor.
- F. Cost of testing which is required solely for the convenience of Contractor in his scheduling and performance of work will be paid by the District and backcharged to the Contractor.
- G. Overtime costs for testing and inspections performed outside the regular work day hours, including weekends and holidays, will be paid for by the District and backcharged to the Contractor. Such costs include overtime costs for the District's Inspector.
- H. Testing Laboratory shall separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the Contractor as specified above.
- I. Testing Laboratory shall furnish to District a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate shall include number of tests, man-hours required for tests, field and plant inspections, travel time, and costs.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
 - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
 - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- B. Tests and inspections for the following will be required in accordance with the current CBC, unless otherwise specified.

3.02 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION (CHAPTER 17A AND 19A)

- A. Inspection:
 - 1. Job Site Inspection: CBC 1705A.3, 1705A.3.5 (Conc. Preplacement), 1705A.3.6 (Placing Record), and 1910A.
 - 2. Batch Plant or Weighmaster Inspection: CBC 1705A.3.3.
 - a. Waiver of Continuous Batch Plant Inspection:
- B. Reinforcing Steel, Including: Verify compliance with approved contract documents and ACI 318, Sections 20.2, 25.2 through 25.7, and 26.6.
 - 1. Reinforcing Bars: CBC 1901A.6; 1910A.2.
 - 2. Tests:
 - a. Tests shall be performed before the delivery of steel to Project site. Steel not meeting specifications shall not be shipped to the Project.
 - b. Testing procedure shall conform to ASTM A615/A615M or .
 - c. Sample at the place of distribution, before shipment:
 - 1) Make one tensile test and one bending test from samples out of 10 tons, or fraction thereof, of each size and kind of reinforcing steel, where taken from bundles as delivered from the mill and properly identified as to heat number.
 - 2) Mill analysis shall accompany report.
 - 3) Where identification number cannot be ascertained, or where random samples are taken, make one series of tests from each 2-1/2 tons, or fraction thereof, of each size and kind of reinforcing steel.
 - 4) Tests on unidentified reinforcing steel will be paid by the District and backcharged to the Contractor.
 - 5) Samples shall include not fewer than 2 pieces, each 18 inches long, of each size and kind of reinforcing steel.
 - d. District's Inspector will inspect all reinforcement for concrete work for size, dimensions, locations and proper placement.

- C. Reinforcing Bar Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, 26.6.4; continuous.
 - 1. Verify weldability of reinforcing bars other than those complying with ASTM A706/A706M; periodic.
 - 2. Inspect single-pass fillet welds, maximum 5/16 inch; periodic.
 - 3. Inspect all other welds; continuous.
 - 4. Reinforcing Bar Welding Inspection: CBC 1705A.3.1; Table 1705A.3, Item 2; 1903A.8.
- D. Anchors Cast in Concrete: Verify compliance with ACI 318, 17.8.2; periodic.
- E. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI 318.
 - 1. Comply with CBC Section 1910A.5; Table 1705A.3, items 4a & 4b, ASCE 7, Section 13.4.
 - 2. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.
 - 3. Other Mechanical and Adhesive Anchors: Verify as per Chapter 17.8.2; periodic.
- F. Anchors Installed in Hardened Concrete: Verify compliance with ACI 318; periodic.
- G. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with CBC Chapter 19A, ACI 318, Sections 26.4.3, 26.4.4; periodic.
- H. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M and ACI 318, Chapter 26.5, 26.12, and record the following, continuous:
 - 1. Slump.
 - 2. Air content.
 - 3. Temperature of concrete.
 - 4. Strength Tests of Concrete: CBC 1905A.1.15; Table 1705A.3 Item 6; ACI 318-14 Sec. 26.12.
- I. Concrete Placement: Verify application techniques comply with approved Contract Documents and ACI 318, Chapter 26.5; continuous.
- J. Specified Curing Temperature and Techniques: Verify compliance with ACI 318, Chapter 26.5.3-26.5.5; continuous.
- K. Concrete Strength in Situ: Verify concrete strength complies with approved Contract Documents, CBC Table 1705A.3, and modified ACI 318, Chapter 26.12.2.1(a).
- L. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Chapter 26.11.1.2(b); continuous.
- M. Welding of Reinforcing Bars: Conduct special inspections and verify Special Inspector's qualifications in accordance with requirements of AWS D1.4/D1.4M.
- N. Materials: If the Contractor cannot provide sufficient data or documentary evidence that concrete materials conform to the quality standards of ACI 318, the AHJ will require that the Special Inspector verify compliance with the appropriate standards and criteria in ACI 318, Chapter 3. CBC 1705A3.
- O. District Inspector (IOR) will do the following:
 - 1. Inspect placing of reinforcing steel and concrete at Project.

2. Obtain weighmaster's certificate and identify mix before accepting each load.
3. Keep daily record of concrete placement, identifying each truck load, time of receipt, and location of concrete in structure.
4. Keep record until completion of Project and make available for inspection by DSA Field Engineer or representative.
5. During progress of work, take an additional number of test cylinders as directed by Architect. Conform to CBC 1905A.1.15 (modified ACI 318). Test cylinders need not be made for concrete used in exterior flatwork.
 - a. ACI 318 Section 26.12.2.1 shall be replaced and the Contractor shall comply with the following:
 - 1) Samples for strength test of each class of concrete placed each day shall not be taken less than once for each 50 cubic yards (38.3m³) of concrete, or not less than once for each 2,000 square feet (186 m²) of surface area of for slabs or walls.
 - 2) Additional samples for seven day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.
6. One set of cylinders shall consist of 4 samples all taken from same batch, one to be tested at age of 7 days and two at 28 days.
7. Make and store cylinders according to ASTM C31/C31M.
8. Deliver cylinders to laboratory or store cylinders in a suitable protected environment for pick up by laboratory personnel.
9. Make slump test of wet concrete according to test for slump of portland cement concrete, ASTM C143/C143M, at least at the same frequency that the cylinders are taken.

3.03 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

- A. Inspection: Comply with CBC 1705A.12.
- B. Testing: Comply with CBC 1705A.13.
- C. Cold Formed Steel Light Frame Construction:
 1. Field welding; periodic.
 2. Screw attachment, bolting, anchoring and other fastening of components within the main seismic force-resisting system; periodic.
- D. Architectural Components: Erection and fastening of components below; periodic.
 1. Exterior cladding; per ICC ESR Report when applicable.
 2. Interior and exterior veneer.
 3. Interior and exterior non-loadbearing walls and partitions.
 4. Suspended ceiling systems and their anchorage, per ICC ESR Report. CBC Section 1705A.12.5 and 1705A.13.2.
- E. Mechanical and Electrical Components:

1. Anchorage of electric equipment required for emergency or standby power systems; periodic.
 2. Installation and anchorage of other electrical equipment; periodic.
 3. Vibration isolation systems where the approved Contract Documents require a nominal clearance of 1/4 inch or less between support frame and seismic restraint; periodic.
 4. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed.
 - a. Verify clearances have been provide as required by Section 13.2.3 of ASCE 7.
 - b. Verify nominal clearance of 3 inches has been provided between fire protection sprinkler drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.
- F. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.
- G. Structural Testing for Seismic Resistance:
1. Non-Structural Components:
 - a. General Design Requirements: Obtain manufacturer certification of compliance with requirements of ASCE 7, Section 13.2.1; periodic.
 - b. Designated Seismic Force-Resisting Non-Structural System Components: Obtain manufacturer certification of compliance with ASCE 7, Section 13.2.2; periodic.
- H. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.04 STRUCTURAL OBSERVATIONS FOR STRUCTURES

- A. Provide Observations: For structure where one or more of the following conditions exist:
1. Such observation is required by the registered design professional responsible for the structural design.
 2. Such observation is specifically required by AHJ.

3.05 SPECIAL ARCHITECTURAL INSPECTIONS

- A. Signs and/or identification devices:
1. Prior to issuance of a final Certificate of Occupancy, Enforcing Agency shall verify installation of signs for information content, appearance, location and Braille per CBC 11B-703.1.1.2.
 - a. Inspection shall include, but not limited to:
 - 1) Braille dots and cells are properly spaced and the size proportion and type raised characters are in compliance with these regulations.
 - 2) Tactile exit signage per CBC 1013.4 and 11B-216.4.1 Exit doors.
 - 3) Tactile floor designation signs in stairways per CBC 1023.9 Stairway identification signs.
 - 4) Tactile special egress control device signs per CBC 1010.1.9.7 Delayed Egress Locks, item 5.1.
 - 5) Elevator car control identification per CBC 11B-407.4.6-8 Elevator car controls.

- 6) Sanitary facilities signage per CBC 11B-216.8 Toilet rooms and bathing rooms; and 11B-703.7.2.6 Toilet and bathing facilities geometric symbols.
- B. Water-resistive barrier coating:
 1. Installation over sheathing substrate per ASTM E2570/E2570M.
- C. Glass and glazing identification:
 1. Verify installation of manufacturer's material mark inspection per CBC 2403.1.
 - a. Safety glazing shall be labeled per CBC 2406.3.

3.06 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified reference standards.
 4. Ascertain compliance of materials and products with requirements of Contract Documents.
 5. Promptly notify Architect, SEOR, IOR, DSA, District and Contractor of observed irregularities or non-conformance of work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.07 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 1. Test samples submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. Immediately upon determination of a test failure, the Laboratory shall telephone the results to the Architect. On the same day, Laboratory shall send test results by email to the Architect and to all relevant responsible parties of the project team, and District's Inspector
- D. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- E. Contractor will pay for re-testing required because of non-compliance with specified requirements.
- F. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
1. See DSA Procedure PR 13-01.
- G. Duties of the Laboratory of Record related to the use of form DSA 152 are as follows:
1. Meet with the Project Inspector, design professionals, and contractor as needed to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
 2. Obtain a copy of the DSA approved construction documents from the design professional in general responsible charge prior to the commencement of construction
 3. Obtain a copy of the DSA approved Statement of Structural Tests and Special Inspections (form DSA 103) from the design professional in general responsible charge prior to the commencement of construction.
 4. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed
 5. Provide material testing as identified in the DSA approved construction documents.
 6. Submit test reports to the Project Inspector on the day the tests were performed for any tests performed on-site
 7. Submit material test reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the material tests were performed. Test

reports are to be submitted to DSA, the Architect, structural engineer, Project Inspector and school district.

- a. As a convenience, and if agreed upon by involved parties, the test reports may be submitted electronically as identified in Section 4 of this procedure.
8. Immediately submit reports of material tests not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to the DSA, Architect, structural engineer, Project Inspector and school district.
9. The Engineering Manager shall submit an interim Laboratory of Record Verified Report (form DSA 291) and the Geotechnical Engineer shall submit an interim Geotechnical Verified Report (form DSA 293) to DSA, the project inspector, school district and the Design Professional in General Responsible Charge.
 - a. The reports are required to be submitted upon any of the following events occurring:
 - 1) Within 14 days of the completion of the material testing/special inspection program.
 - 2) Work on the project is suspended for a period of more than one month.
 - 3) The services of the laboratory of record are terminated for any reason prior to completion of the project.
 - 4) The DSA requests a Verified Report. (See interim verified reports below. This is a "DSA request.")
10. The Engineering Manager shall submit an interim verified report (form DSA 291) and the Geotechnical Engineer shall submit form DSA 293 to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required material testing. The sections are:
 - a. Initial Site Work
 - b. Foundation Prep
 - c. Vertical Framing
 - d. Horizontal Framing
 - e. Appurtenances
 - f. Finish Site Work
 - g. Other Work
 - h. Final
- H. Duties of Special Inspectors, employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
 1. Meet with the Project Inspector, design professionals, and contractor as needed to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
 2. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed.
 3. Perform work under the supervision of the Engineering Manager for the Laboratory of Record

4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards
 5. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
 6. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
 7. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to the DSA, Architect, structural engineer, Project Inspector and school district.
 8. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to the Architect, structural engineer, Project Inspector and school district.
 9. Submit Verified Report forms DSA 292 to the DSA, Project Inspector, district and design professional in responsible charge.
 10. The reports are required to be submitted upon any of the following events occurring:
 11. Within 14 days of the completion of the special inspection work.
 12. Work on the project is suspended for a period of more than one month.
 13. The services of the special inspector are terminated for any reason prior to completion of the project.
 14. The DSA requests a Verified Report. (See interim verified reports below. This is a "DSA request")
 15. Submit an interim Verified Report (form DSA 292) to the DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152, prior to the Project Inspector signing off that section of the project inspection card, if that section required special inspections. The sections are:
 - a. Initial Site Work
 - b. Foundation
 - c. Vertical Framing
 - d. Horizontal Framing
 - e. Appurtenances
 - f. Non-Building Site Structures
 - g. Finish Site Work
 - h. Other Work
 - i. Final
 16. The Verified Reports shall be sent electronically to the DSA.
- I. Duties of Special Inspectors, not employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
1. Meet with the project inspector, Laboratory of Record, the design professionals, and the contractors as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.

2. Report all project related activities to the project inspector. The project inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
3. Perform work under the direction of the design professional in general responsible charge, as defined in Section 4-335(f)1B of the California Administrative Code (Title 24, Part 1).
4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
5. Prepare detailed daily inspection reports outlining the work inspected and provide the project inspector a copy of the reports on the same day the inspections were performed.
6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
8. Submit Special Inspection Verified Report forms DSA 292 to DSA, the project inspector, the school district and the Design Professional in General Responsible Charge.
 - a. The reports are required to be submitted upon any of the following events occurring:
 - 1) Within 14 days of the completion of the special inspection work.
 - 2) Work on the project is suspended for a period of more than one month.
 - 3) The services of the special inspector are terminated for any reason prior to completion of the project.
 - 4) DSA requests a verified report. (See interim verified reports below. This is a "DSA request.")
9. Submit an interim Special Inspection Verified Report (form DSA 292) to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required special inspections.
 - a. The sections are:
 - 1) Initial Site Work
 - 2) Foundation Prep
 - 3) Vertical Framing
 - 4) Horizontal Framing
 - 5) Appurtenances
 - 6) Finish Site Work
 - 7) Other Work
 - 8) Final

3.08 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. DSA Requirements:

1. Each Multi-Prime Contractor or Subcontractor shall comply with DSA Construction Oversight Procedure PR 13-01. California Code of Regulations (CCR), Title 24, Part 1, CCR, Chapter 4, Article 1 (Sections 4-211 through 4-220) and Group1, Articles 5 and 6 (Sections 4-331 through 4-344) which provide regulations governing the construction process for projects under the jurisdiction of the Division of the State Architect (DSA).
 - a. Assist the Project Inspector (IOR) and complete and fill out the following forms during the course of construction.
 - 1) Form-102-IC: Construction Start Notice/ Inspection Card Request: Verify Project Inspector has an active form issued by DSA.
 - 2) Form-151: Project Inspector Notifications: Contractor to notify IOR and assist.
 - 3) Form-152: Project Inspection Card: See below.
 - 4) Form-154: Notice of Deviations/ Resolution of Deviations: Contractor to verify all deviations are reviewed, corrected, and accepted by the design professional, and filed with DSA through the Project Inspector (IOR).
 - (a) When the Project Inspector identifies deviations from the DSA approved construction documents the inspector must verbally notify the contractor. If the deviations are not corrected within a reasonable time frame, the inspector is required to promptly issue a written notice of deviation to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (b) When the noticed deviations are corrected, the inspector is required to promptly issue a written notice of resolution to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (c) Deviations include both construction deviations and material deficiencies.
 - (d) The written notice of deviations shall be made using form DSA 154.
 - (e) The notice of resolution of deviations shall be made using the original form DSA 154 that reported the deviations.
 - 5) Form-156: Commencement/Completion of Work Notification
 - 6) Form-6.C: Verified Report – Contractor: From each contractor having a contract with the school board.
2. Duties of Contractor related to the use of form DSA 152 are as follows:
 - a. The Contractor shall carefully study the DSA approved documents and shall plan a schedule of operations well ahead of time.
 - b. If at any time it is discovered that work is being done which is not in accordance with the DSA approved construction documents, the Contractor shall correct the work immediately.
 - c. Verify that forms DSA 152 are issued for the project prior to the commencement of construction.
 - d. Meet with the design team, the Laboratory of Record and the Project Inspector to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
 - e. Notify the Project Inspector, in writing, of the commencement of construction of each and every aspect of the work at least 48 hours in advance by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.

- f. Notify the Project Inspector of the completion of construction of each and every aspect of the work by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
- g. Consider the relationship of the signed off blocks and sections of the form DSA 152 and the commencement of subsequent work. Until the Project Inspector has signed off applicable blocks and sections of the form DSA 152, the Contractor may be prohibited from proceeding with subsequent construction activities that cover up the unapproved work. Any subsequent construction activities, that cover up the unapproved work, will be subject to a "Stop Work Order" from the DSA or the district and are subject to removal and remediation if found to be in non-compliance with the DSA approved construction documents.
- h. Submit the final verified report. All prime contractors are required to submit final Contractor Verified Reports (form DSA 6-C) to DSA and the project inspector.
 - 1) The reports are required to be submitted upon any of the following events occurring:
 - (a) The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the owner can occupy or utilize the project.
 - (b) Work on the project is suspended for a period of more than one month.
 - (c) The services of the contractor are terminated for any reason prior to the completion of the project.
 - (d) DSA requests a verified report.

B. Contractor Responsibilities, General:

- 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
- 2. Availability of Samples
 - a. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by the District's Inspector. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory or District's Inspector.
 - b. If work which is required to be tested or inspected is covered up without prior notice or approval, such work may be uncovered at the discretion of Architect at no additional cost to the District. Refer to paragraph "Payments" herein.
 - c. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of 10 working days in advance of all required tests, and a minimum of 2 working days in advance of all required inspections. All extra expenses resulting from a failure to notify the Laboratory will be paid by the District and backcharged to the Contractor.
 - d. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance, notice of cancellations, or time extension will be paid for by the District and backcharged to the Contractor.
- 3. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.

4. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
5. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
7. The Contractor shall notify the District's Inspector a minimum of 5 working days in advance of the manufacture of material to be supplied by him under the Contract Documents, which must be by terms of the Contract be tested, in order that the District may arrange for the testing of such material at the source of supply.
8. Material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Project.
9. The District will select and pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract conditions. Any direct payments by the Contractor to the testing laboratory on this project is prohibited.
- C. Contractor shall submit a written statement of responsibility to comply with CBC section 1704A.4.
 1. Each contractor responsible for the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - a. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
 - b. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official;
 - c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports; and
 - d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

- E. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- F. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall be promptly removed from the Project site.

3.09 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

- A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of District.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Waste removal facilities and services.
- F. Project identification sign.

1.02 RELATED REQUIREMENTS

- A. Section 01 57 19 - Temporary Environmental Controls: Filtration requirements during construction and final cleaning.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.04 TEMPORARY UTILITIES

- A. District will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Existing facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.05 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
 - 1. Provide temporary toilet facilities if maximum number of personnel on project is greater than 10.
 - 2. Submit proposed location of temporary toilet(s) to Construction Manager for approval.
 - a. Place on-site portable toilets away from building air intakes and entryway.
- B. Maintain daily in clean and sanitary condition.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

- A. Construction: Contractor's option.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.09 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.10 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from District-occupied areas, to prevent penetration of dust and moisture into District-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:
 - 1. STC rating of 35 in accordance with ASTM E90.
 - 2. Maximum flame spread rating of 75 in accordance with ASTM E84.
- C. Paint surfaces exposed to view from District-occupied areas.

1.11 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and District's operations from unauthorized entry, vandalism, or theft.

- B. Coordinate with District's security program.

1.12 CAFETERIA AND FOOD

- A. Construction personnel shall police their own areas. All cups, cans, paper, wrappers, and discarded food must be placed in trash receptacles at end of each break.
- B. Contractor(s) shall submit to Construction Manager proposed location of any break areas and eating areas for approval.

1.13 SMOKING AND TOBACCO

- A. Smoking and vaping is not permitted on property.
- B. No chewing tobacco or spitting of tobacco is permitted.

1.14 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and District.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.15 WASTE REMOVAL

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.16 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without District permission except those required by law.

1.17 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

- C. Provide separate private office similarly equipped and furnished, for use of District.
- D. Locate offices a minimum distance of 30 feet from existing and new structures.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality before commencement of construction; existing building areas only.
- D. Testing indoor air quality after completion of construction.
- E. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cover duct openings and protect mechanical equipment during construction. Provide tape, plastic, sheet metal or other methods acceptable to DSA.
 - a. Comply with California Green Code Section 5.504.3.
 - 2. Cleaning of ductwork is not contemplated under this Contract.
 - 3. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
 - 4. Establish condition of existing ducts and equipment prior to start of alterations.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and inspection services.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary construction requirements.
- C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- D. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): HVAC filters.
- E. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.
- F. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Cleaning air ducts, equipment, and terminal units.

1.04 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

- B. ASHRAE Std 129 - Measuring Air-Change Effectiveness.
- C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- D. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- E. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- F. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- G. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.
- H. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.

1.05 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedures.
- C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- D. Duct and Terminal Unit Inspection Report.
- E. Air Contaminant Test Plan: Identify:

1. Testing agency qualifications.
 2. Locations and scheduling of air sampling.
 3. Test procedures, in detail.
 4. Test instruments and apparatus.
 5. Sampling methods.
- F. Air Contaminant Test Reports: Show:
1. Location where each sample was taken, and time.
 2. Test values for each air sample; average the values of each set of 3.
 3. HVAC operating conditions.
 4. Certification of test equipment calibration.
 5. Other conditions or discrepancies that might have influenced results.
- G. Ventilation Effectiveness Test Plan: Identify:
1. Testing agency qualifications.
 2. Description of test spaces, including locations of air sampling.
 3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
 4. Test instruments and apparatus; identify tracer gas to be used.
 5. Sampling methods.
- H. Ventilation Effectiveness Test Reports: Show:
1. Include preliminary tests of instruments and apparatus and of test spaces.
 2. Calculation of ventilation effectiveness, E.
 3. Location where each sample was taken, and time.
 4. Test values for each air sample.
 5. HVAC operating conditions.
 6. Other information specified in ASHRAE Std 129.
 7. Other conditions or discrepancies that might have influenced results.

1.07 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See Section 01 61 16.
- B. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- C. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
- D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- E. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 - 3. Do not use return air ductwork for ventilation unless absolutely necessary.
 - 4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.
- F. Do not store construction materials or waste in mechanical or electrical rooms.
- G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.
 - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 - 5. Clean return plenums of air handling units.
 - 6. Remove intake filters last, after cleaning is complete.
- H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

- A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

- B. Perform building flush-out before occupancy.
- C. Do not start flush-out until:
 - 1. All construction is complete.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
 - 4. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 - 5. New HVAC filtration media have been installed.
- D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
 - 1. Obtain District's concurrence that construction is complete enough before beginning flush-out.
 - 2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
 - 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
 - 4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.
- E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

- A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.
- B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.
- C. Perform air contaminant testing before occupancy.
- D. Do not start air contaminant testing until:
 - 1. All construction is complete, including interior finishes.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
 - 4. New HVAC filtration media have been installed.
- E. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
 2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
 3. Collect samples from height from 36 inches to 72 inches above floor.
 4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
 5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
 6. When retesting the same building areas, take samples from at least the same locations as in first test.
- F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.
- G. Analyze air samples and submit report.
- H. Air Contaminant Concentration Limits:
1. Comply with CalGreen Building Standards Section 5.504.4.5, Table 504.4.4.5 "Formaldehyde Limits".
 2. Formaldehyde: Not more than 16.3 parts per billion.
 3. PM10 Particulates: Not more than 20 micrograms per cubic meter.
 4. Comply with CalGreen Building Standards Section 5.504, Table 504.4.3 "VOC Content Limits for Architectural Coatings".
 5. Comply with CalGreen Building Standards Section 5.504, Table 504.4.1 "Adhesive VOC Limit" and Table 504.4.2 "Sealant VOC Limit".
 6. Total Volatile Organic Compounds (TVOCs): Not more than 200 micrograms per cubic meter.
 7. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
 8. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
 9. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.
 10. Regulated Pollutants: Measure in relation to outside air; not more than contained in outside air.
- I. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
 2. Particulates: EPA 600/4-90/010 Method IP-10.

3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
 4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
 5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.
- J. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to District, or conduct full building flush-out specified above.

3.04 VENTILATION EFFECTIVENESS TESTING

- A. Perform ventilation effectiveness testing during commissioning period.
- B. Do not begin ventilation effectiveness testing until:
 1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
 2. Building flush-out or air contaminant testing has been completed satisfactorily.
 3. New HVAC filtration media have been installed.
- C. Test each air handler zone in accordance with ASHRAE Std 129.
- D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to District.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Project informational signs.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Responsibility to provide signs.
- B. Section 05 50 00 - Metal Fabrications: Miscellaneous connectors.
- C. Section 06 10 00 - Rough Carpentry: General requirements for structural and non-structural rough carpentry Work.
- D. Section 09 91 13 - Exterior Painting: General requirements for paint products and painting.

1.03 REFERENCE STANDARDS

- A. FHWA (SHS) - Standard Highway Signs and Markings.

1.04 QUALITY ASSURANCE

- A. Design sign and structure to withstand 80 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
 - 1. Sign painter shall be regularly engaged and specializing in the design, execution, construction and installation of exterior signage of equivalent type, size and complexity as those required for Project.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate to support sign panel and suitable for specified finish.
- B. Sign Surfaces: Exterior grade plywood with medium or high density phenolic sheet overlay, minimum 3/4 inch thick, standard large sizes to minimize joints. Provide sheet thickness as required to span across framing members and provide even, smooth surface without waves or buckles.

- C. Rough Hardware: Galvanized steel, as specified in Section 05 50 00 - Metal Fabrications and Section 06 10 00 - Rough Carpentry..
- D. Sign Face Paint and Primers: Exterior quality, primer, two gloss enamel finish coats; sign background of color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.
- E. Sign Structure Paint and Primers: Exterior quality, primer, one gloss enamel finish coats; color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.
- F. Lettering: Exterior quality paint, colors as selected.

2.02 PROJECT IDENTIFICATION SIGN

- A. Provide painted sign of construction, design, and content shown on Drawings, location designated or agreed to by Architect.
 - 1. Graphic design, text, style of lettering, and colors shall be as directed; assume 4 colors and special graphic for Project title.
- B. Content:
 - 1. Project number, title, logo and name of District as indicated on Contract Documents.
 - 2. Include organizational logos of parties identified on sign.
 - 3. Names and titles of authorities.
 - 4. Names and titles of Architect and Consultants.
 - 5. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Architect.
 - 1. Sign Painting: Sign panels shall be shop painted and field installed.
 - a. Sign painting shall be performed by professional sign painters. Silk screen method is recommended in order to accurately depict graphics.
 - b. Paint back and edges of sign panels for complete weather resistance and finished appearance.
- D. Project Address Signs: Provide Project name and street address signs, minimum of 4 feet wide, to identify Project to facilitate deliveries.
 - 1. Graphic design and colors shall match Project Identification Sign.
 - 2. Text shall be as directed.
- E. Lettering: Standard Alphabet Series C, as specified in FHWA (SHS).

2.03 PROJECT INFORMATIONAL SIGNS

- A. Restrictions: Signs other than Project Identification Sign specified above and Project Informational Signs specified below shall not be displayed without approval of Architect.
- B. Project Informational Signs: Informational signs, necessary for conduct of construction activities or required by governmental authorities having jurisdiction may be displayed when in conformance to sign construction and graphic requirements specified in this Section.
 - 1. Architect may review such signs. If so, review will be for sign construction, and graphic designs only.

2. Adequacy of signage for safety and conformance to requirements of authorities having jurisdiction and trade practices shall be solely Contractor's responsibility.
- C. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
 1. Colors shall be as required by authorities having jurisdiction and, if not otherwise required, of colors consistent with Project graphics.
 2. Informational signage shall be produced by professional sign painters and be of size and lettering style consistent with use.
- D. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
- E. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at location of high public visibility adjacent to main entrance to site.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces and edges of sign, supports, and framing for a finished appearance.
- F. Project Identification Sign Installation
 1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
 2. Installation: Erect Sign on site at a lighted location of high public visibility, adjacent to the main entrance to the site, as approved by Architect.
 - a. Install sign at height for optimum visibility, on ground-mounted poles or attached to portable structure on skids.
 - b. Portable structure shall resist overturning force of wind.
 3. Street Address Signs: Locate and install signs at each access point from public streets.
- G. Project Informational Signs Installation:
 1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
 2. Project Informational Signs Installation:
 - a. Locate signs as necessary for construction activities and as required by authorities having jurisdiction.
 - b. Install informational signs for optimum visibility, on ground-mounted posts or temporarily attached to surfaces of structures.
 - c. Attachment methods shall leave no permanent disfiguration or discoloration on completed Work.

3.02 MAINTENANCE

- A. Maintain signs and supports neat clean condition. Repair all deterioration, weathering and damage to structure framing, and signage.
- B. Sign Relocation: Relocate signs as required by progress of the Work.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area prior to Substantial Completion review.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
 - 1. System Completeness.
 - 2. Installation of Products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for District-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Identification of District-supplied products.
- B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.
- F. Divisions 31 - 32: Sitework.

1.03 REFERENCE STANDARDS

- A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- B. NFPA 70 - National Electrical Code.
 - 1. Use California Electrical Code.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.05 QUALITY ASSURANCE

- A. CAL (CDPH SM) v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Drawings and Specifications:
 - 1. If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor is to submit a Request for Interpretation from the Architect.
 - a. As noted in the General Conditions, the more stringent requirements govern, including cost of materials and/or installation.
 - 2. If a specific product is indicated on the Drawings for use, then that product is to be used without exception in the location identified.
 - 3. If the Contractor proposes the use of another product other than the item indicated, whether or not listed in these specifications, Contractor is to submit the product using the complete substitution process. See the the Article titled "SUBSTITUTIONS".
 - 4. DSA (Division of the State Architect) approval is also required prior to the use or installation of any substitution, on any product or location of product (requiring a revision to the Drawings or Specifications), included in these construction documents.
 - a. Installation of a non-approved product may result in the Contractor removing and replacing the non-approved product at the Contractor's own expense.
- B. General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock, and include materials, equipment, assemblies, fabrications and systems.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model designations indicated in the manufacturer's published product data.
 - 2. Materials: Products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed or installed to form a part of the Work.
 - 3. Equipment: A product with operating parts, whether motorized or manually operated, that requires connections such as wiring or piping.

- C. Specific Product Requirements: Refer to requirements of Section 01 40 00 - Quality Requirements and individual product technical Sections for specific requirements for products.
- D. Minimum Requirements: Specified requirements for products are minimum requirements. Refer to general requirements for quality of the Work specified in Section 01 40 00 - Quality Requirements and elsewhere herein.
- E. Standard Products:
 - 1. Where specific products are not specified, provide standard products of types and kinds that are suitable for the intended purposes and that are usually and customarily used on similar projects under similar conditions.
 - 2. Products shall be as selected by Contractor and subject to review and acceptance by the District and Architect.
- F. Product Completeness:
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 - 2. Comply with additional requirements specified herein in Article titled "SYSTEM COMPLETENESS".
- G. Code Compliance:
 - 1. All products, other than commodity products prescribed by Code, are to have a current ICC Evaluation Service Research Report (ICC ESR), CABO National Evaluation Report (NER), or other testing agencies as accepted by the Division of the State Architect.
 - 2. Refer to additional requirements specified in Section 01 41 00 - Regulatory Requirements.

2.02 SYSTEM COMPLETENESS

- A. The Contract Drawings and Specifications are not intended to be comprehensive directions on how to produce the Work. Rather, the Drawings and Specifications are instruments of service prepared to describe the design intent for the completed Work.
- B. It is intended that all equipment, systems and assemblies be complete and fully functional even though not fully described. Provide all products and operations necessary to achieve the design intent described in the Contract Documents.
- C. Refer to related general requirements specified in Section 01 41 00 - Regulatory Requirements regarding compliance with minimum requirements of applicable codes, ordinances and standards.
- D. Omissions and Misdescriptions: Contractor shall report to Architect immediately when elements essential to proper execution of the Work are discovered to be missing or misdescribed in the Drawings and Specifications or if the design intent is unclear.
 - 1. Should an essential element be discovered as missing or misdescribed prior to receipt of Bids, an Addendum will be issued so that all costs may be accounted for in the Contract Sum.

2. Should an obvious omission or misdescription of a necessary element be discovered and reported after execution of the Agreement, Contractor shall provide the element as though fully and correctly described, and a no-cost Change Order shall be executed.
3. Refer to related General Requirements specified in Section 01 30 00 - Administrative Requirements and 01 31 14 - Facility Services Coordination regarding construction interfacing and coordination.

2.03 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
 1. Provide products that fully comply with the Contract Documents, are undamaged and unused at installation.
 2. Comply with additional requirements specified herein in Article titled "PRODUCT OPTIONS".
- B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
 1. Made outside the United States, its territories, Canada, or Mexico.
 2. Containing lead, cadmium, or asbestos.
- D. Where other criteria are met, Contractor shall give preference to products that:
 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 4. Have longer documented life span under normal use.
 5. Result in less construction waste. See Section 01 74 19
- E. Provide interchangeable components of the same manufacture for components being replaced.
 1. To the fullest extent possible, provide products of the same kind from a single source. Products required to be supplied in quantity shall be the same product and interchangeable throughout the Work.
 2. When options are specified for the selection of any of two or more products, provide product selected to be compatible with products previously selected.
- F. Product Nameplates and Instructions:
 1. Except for required Code-compliance labels and operating and safety instructions, locate nameplates on inconspicuous, accessible surfaces. Do not attach manufacturer's identifying nameplates or trademarks on surfaces exposed to view in occupied spaces or to the exterior.
 2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Nameplates shall contain identifying information and essential operating data such as the following example:
 - a. Name of manufacturer
 - b. Name of product

- c. Model and serial number
- d. Capacity
- e. Operating and Power Characteristics
- f. Labels of Tested Compliance with Codes and Standards
- 3. Refer to additional requirements which may be specified in various sections, as included in this Project Manual.
- 4. For each item of service-connected or power-operated equipment, provide operating and safety instructions, permanently affixed and of durable construction, with legible machine lettering. Comply with all applicable requirements of authorities having jurisdiction and listing agencies.
- G. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to CEC/NFPA 70, include lugs for terminal box.
- H. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.04 PRODUCT OPTIONS

- A. Unless the specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words "or equal."
 - 1. See Section 01 25 00 - Substitution Procedures.
- B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
 - 1. Reference Standards:
 - a. Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified.
 - b. Refer to general requirements specified in Section 01 42 19 - Reference Standards regarding compliance with referenced standards, standard specifications, codes, practices and requirements for products.
 - 2. Product Description:
 - a. Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements.
 - 3. Performance Requirements:
 - a. Where Specifications require compliance with performance requirements, provide product(s) that comply and are recommended by the manufacturer for the intended application.
 - b. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.

- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products Specified by Identification of Manufacturer and Product Name or Number:
 - 1. "Specified Manufacturer": Provide the specified product(s) of the specified manufacturer.
 - a. If only one manufacturer is specified, without "acceptable manufacturers" being identified, provide only the specified product(s) of the specified manufacturer.
 - b. If District standard is indicated make all efforts to provide that product.
 - c. If the phrase "or equal" or "approved equal" is stated or reference is made to the "or equal provision," products of other manufacturers may be provided if such products are equivalent to the specified product(s) of the specified manufacturer.
 - 1) Equivalence shall be demonstrated by submission of information in compliance with requirements of Section 01 25 00 - Substitution Procedures.
 - 2. "Acceptable Manufacturers":
 - a. Product(s) of the named manufacturers, if equivalent to the specified product(s) of the specified manufacturer, will be acceptable in accordance with the requirements of Section 01 25 00 - Substitution Procedures.
 - 1) Exception: Considerations regarding changes in Contract Time and Contract Sum will be waived if no increase in Contract Time or Contract Sum results from use of such equivalent products.
 - 3. Unnamed manufacturers: Product(s) of unnamed manufacturers will be acceptable when disclosed during the bidding period and only as follows:
 - a. Unless specifically stated that substitutions will not be accepted or considered, the phrase "or equal" shall be assumed to be included in the description of specified product(s).
 - b. Equivalent products of unnamed manufacturers will be accepted in accordance with the "or equal" provision specified herein, below.
 - c. If provided, products of unnamed manufacturers shall be subject to the requirements of Section 01 25 00 - Substitution Procedures.
 - 4. Quality basis:
 - a. Specified product(s) of the specified manufacturer shall serve as the basis by which products by named acceptable manufacturers and products of unnamed manufacturers will be evaluated.
 - b. Where characteristics of the specified product are described, where performance characteristics are identified or where reference is made to industry standards, such characteristics are specified to identify the most significant attributes of the specified product(s) which will be used to evaluate products of other manufacturers.
- E. Products Specified by Combination of Methods: Where products are specified by a combination of attributes, including manufacturer's name, product brand name, product catalog or identification number, industry reference standard, or description of product characteristics, provide products conforming to all specified attributes.
- F. "Or Equal" Provision: Where the phrase "or equal" or the phrase "or approved equal" is included, equivalent product(s) of unnamed manufacturer(s) may be provided as specified

above in subparagraph titled "Unnamed manufacturers" and Section 01 25 00 - Substitution Procedures with the following conditions:

1. The requirements of Section 01 25 00 - Substitution Procedures applies to products provided under the "or equal" provision.
 - a. Exception: If the proposed product(s) are determined to be equivalent to the specified product(s) of the specified manufacturer, the requirement specified for substitutions to result in a net reduction in Contract Time or Contract Sum will be waived.
 2. Use of product(s) under the "or equal" provision shall not result in any delay in completion of the Work, including completion of portions of the Work for use by District or for work under separate contract by District.
 3. Use of product(s) under the "or equal" provision shall not result in any costs to the District, including design fees and permit and plan check fees.
 4. Use of product(s) under the "or equal" provision shall not require substantial change in the intent of the design, in the opinion of the Architect.
 - a. The intent of the design shall include functional performance and aesthetic qualities.
 5. The determination of equivalence will be made by the Architect and District, and such determination shall be final.
- G. Visual Matching:
1. Where Specifications require matching a sample, the decision by the Architect on whether a proposed product matches shall be final.
 2. Where no product visually matches but the product complies with other requirements, comply with provisions for substitutions for selection of a matching product in another category.
- H. Visual Selection of Products:
1. Where requirements include the phrase "as selected from manufacturer's standard colors, patterns and textures", or a similar phrase, selections of products will be made by indicated party or, if not indicated, by the Architect. The will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.
 2. The Architect will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.

2.05 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 01 10 00 - Summary for identification of District-supplied products.
- B. District's Responsibilities:
 - 1. Arrange for and deliver District reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review District reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with District.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
 - 1. Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces.
 - 2. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport products by methods to avoid product damage.
- F. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- G. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Inspection Provisions: Arrange storage to provide access for inspection and measurement of quantity or counting of units.
- D. Structural Considerations: Store heavy materials away from the structure in a manner that will not endanger supporting construction.
- E. Store and protect products in accordance with manufacturers' instructions.
- F. Store with seals and labels intact and legible.
- G. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- H. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- I. For exterior storage of fabricated products, place on sloped supports above ground.
 - 1. Place products on raised blocks, pallets or other supports, above ground and in a manner to not create ponding or misdirection of runoff.
- J. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- K. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
 - 1. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.
 - 2. Remove and replace products damaged by improper storage or protection with new products at no change in Contract Sum or Contract Time.
 - 3. Weather-Resistant Storage:
 - a. Store moisture-sensitive products above ground, under cover in a weathertight enclosure or covered with an impervious sheet covering. Provide adequate ventilation to avoid condensation.
 - b. Maintain storage within temperature and humidity ranges required by manufacturer's instructions.
 - c. Store loose granular materials on solid surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Comply with manufacturer's warranty conditions, if any.
- M. Do not store products directly on the ground.
- N. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- O. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- P. Prevent contact with material that may cause corrosion, discoloration, or staining.
- Q. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- R. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.05 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products, except where more stringent requirements are specified, are necessary due to Project conditions or are required by authorities having jurisdiction.
- B. Anchor each product securely in place, accurately located and aligned with other Work.
- C. Clean exposed surfaces and provide protection to ensure freedom from damage and deterioration at time of Substantial Completion review. Refer to additional requirements specified in General Conditions, Section 01 50 00 - Temporary Construction Facilities and Controls and 01 70 00 - Execution and Closeout Requirements.

3.06 PROTECTION OF COMPLETED WORK

- A. Provide barriers, substantial coverings and notices to protect installed Work from traffic and subsequent construction operations.
- B. Remove protective measures when no longer required and prior to Substantial Completion review of the Work.
- C. Comply with additional requirements specified in Section 01 50 00 - Temporary Construction Facilities and Controls.

END OF SECTION

SECTION 01 61 16
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.
- C. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 07 92 00 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Products making up wall and ceiling assemblies.
 - 5. Thermal and acoustical insulation.
 - 6. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Exterior and interior paints and coatings.
 - 2. Exterior and interior adhesives and sealants, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Concrete.
2. Clay brick.
3. Metals that are plated, anodized, or powder-coated.
4. Glass.
5. Ceramics.
6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board.
- E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- F. CHPS (HPPD) - High Performance Products Database.
- G. CRI (GL) - Green Label Testing Program - Certified Products.
- H. CRI (GLP) - Green Label Plus Testing Program - Certified Products.
- I. GreenSeal GS-36 - Adhesives for Commercial Use.
- J. SCAQMD 1113 - Architectural Coatings.
- K. SCAQMD 1168 - Adhesive and Sealant Applications.
- L. SCS (CPD) - SCS Certified Products.
- M. UL (GGG) - GREENGUARD Gold Certified Products.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.
 1. Use the form following this section for installer certifications.
- D. Verification of compliance with VOC limits as specified in the CalGreen Code Section 5.504 shall be provided at the request of the Building Inspector.
 1. Product certification and specifications.

2. Chain of custody certifications.
3. Product, labeled and invoiced as meeting the Composite Wood Products regulation.
4. Exterior grade products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269 or European 636 3S standards
5. Other methods approved by the building official.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 1. Wet-Applied Products: State amount applied in mass per surface area.
 2. Paints and Coatings: Test tinted products, not just tinting bases.
 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 4. Product data submittal showing VOC content is NOT acceptable evidence.
 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scs-certified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
 - d. Certification by manufacturer that product complies with requirements.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. All VOC restricted products shall be compliant with local jurisdiction, South Coast Air Quality Management District, Air Pollution Control District, County of San Diego, and California Green Standards Code, Rules and Regulations in effect at the time of installation. Products specified in this project shall be used as a basis of design. Updated products that are compliant with the rules in force at the time of installation shall be submitted as substitutions when they become available.
 - 1. If a product is found to be non-compliant with the VOC rules at the scheduled time of installation, notify the Architect a minimum of 90 days prior to installation. Contractor shall submit a suggested compliant product that is equal to the performance and cost of the specified product using the substitution procedure.

2.02 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 - a. Comply with CalGreen Building Standards Section 5.504.4.5, Table 504.4.4.5 "Formaldehyde Limits".
 - 2. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Aerosol Adhesives: GreenSeal GS-36.
 - 3. Joint Sealants: SCAQMD 1168 Rule.
 - 4. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - d. CalGreen Building Standards Section 5.504, Table 504.4.3 "VOC Content Limits for Architectural Coatings".
 - e. Clear Wood Finishes, Floor Coatings, Stains, Primers and Shellacs: Do not exceed the VOC content limits established in SCAQMD 1113 rule.
 - 5. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.
 - 6. Carpet, Carpet Tile, and Adhesive: Provide products having VOC content not greater than that required for CRI (GLP) certification.

- a. Comply with CalGreen Building Standards Section 5.504, Table 504.4.1 "Adhesive VOC Limit".
- 7. Carpet Cushion: Provide products having VOC content not greater than that required for CRI (GL) certification.
 - a. Comply with CalGreen Building Standards Section 5.504, Table 504.4.1 "Adhesive VOC Limit".
- D. Other Product Categories: Comply with limitations specified elsewhere.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to District.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 61 16.01

ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

.01 FORM

A. Identification:

1. Project Name: Foothills Adult Education Center
2. Project No.: 1-30-47
3. Architect: Ruhnau Clarke Architects

B. Use of This Form:

1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
 - a. Each installer of work on this project is required to certify that his/their use of these particular materials complies with the contract documents and to provide documentation showing that the products used do not contain the prohibited content.
2. Contractor is required to obtain and submit this form from each installer of work on this project.
3. For each product category listed, check the correct paragraph.
4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

C. VOC content restrictions are specified in Section 01 61 16.

1. Volatile organic compounds (VOCs) are defined by the U.S. EPA, California Air Resources Board (CARB), South Coast Air Quality Management District (SCAQMD), along with other state and local regulations applicable to this project.

1.01 PRODUCT CERTIFICATION

A. I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

C. ____ Adhesives: I certify that the installation work of my firm on this project has not required the use of any adhesives.

OR (certify either the above or the below, not both)

D. ____ Adhesives: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Sections 01 6000 and on this project; product data and MSDS sheets for all adhesives used, whether specified or not, are attached.

E. ____ Joint Sealants: I certify that the installation work of my firm on this project has not required the use of any gunnable or pourable joint sealants.

OR (certify either the above or the below, not both)

F. ____ Joint Sealants: I certify that my firm has NOT installed any joint sealant with VOC content exceeding that specified in Section 07 92 00 - Joint Sealants on this project; product data and MSDS sheets for all joint sealants used, whether specified or not, are attached.

G. ____ Coatings: I certify that the installation work of my firm on this project has not required the use of any coatings.

OR (certify either the above or the below, not both)

H. ____ Coatings: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Sections 01 6000 and on this project; product data and MSDS sheets for all coatings used, whether specified or not, are attached.

I. ____ Composite Wood and Agrifiber Products: I certify that the work of my firm on this project has not required the use of any composite wood or agrifiber products, as defined above.

OR (certify either the above or the below, not both)

J. ____ Composite Wood and Agrifiber Products: I certify that the composite wood and agrifiber products, as defined above, furnished or installed by my firm DO NOT contain any ADDED urea-formaldehyde binder; product data and MSDS sheets for products used, whether specified or not, are attached.

2.01 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

A. Firm Name: _____

B. Print Name: _____

C. Signature: _____

D. Title: _____ (officer of company)

E. Date: _____

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of District personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 31 14 - Facility Services Coordination: Coordination of trades and BIM documents.
- D. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- E. Section 01 45 33 - Code-Required Special Inspections: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- F. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- G. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.
- H. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- I. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- J. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- K. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- L. Section 07 84 00 - Firestopping.
- M. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.

2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

- A. CFC Ch. 33 - Fire Safety During Construction and Demolition.
- B. CFC Ch. 35 - California Fire Code - Chapter 35 - Welding and Other Hot Work.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 1. On request, submit documentation verifying accuracy of survey work.
 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of District or separate Contractor.
 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work. Include shop drawings as necessary to identify locations and communicate descriptions.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Effect on work of District or separate Contractor.
 - f. Effect on existing construction of District and, if applicable, work for Project being provided by District under separate contract.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
 7. Include written evidence that those performing work under separate contract for District have been notified and acknowledge that cutting and patching work will be occurring. Include written permission for intended cutting and patching, included scheduled times.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 1. Minimum of 5 years of documented experience.

- B. For surveying work, employ a land surveyor registered in California and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in California. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in California.

1.06 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
 - 2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of District's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
- D. Temporary Supports: Provide supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- E. Weather Protection: Provide protection from elements for areas which may be exposed by uncovering Work. Maintain excavations free of water.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
 - 1. Coordinate operations of the various trades to assure efficient and orderly installation of each part of Work.
 - 2. Coordinate Work operations of the various trades that depend on each other for proper installation, connection, and operation of Work, including but not limited to:
 - a. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.
 - b. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - c. Provide provisions to accommodate items scheduled for later installation.
 - 3. Prepare and administer coordination drawings. Refer to Section 01 31 14 - Facility Services Coordination.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Notify the District at least 48 hours before staking is to be started.
- B. Verify locations of survey control points prior to starting work.
- C. Promptly notify Architect of any discrepancies discovered.

- D. Contractor shall locate and protect survey control and reference points.
- E. Control datum for survey is that established by District provided survey.
- F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- G. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- I. Utilize recognized engineering survey practices.
- J. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- K. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- L. Periodically verify layouts by same means.
- M. Maintain a complete and accurate log of control and survey work as it progresses.
- N. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Dimensions for Accessibility:
 - 1. Conventions: See CBC Figure 11B-104. Dimensions that are not stated as "maximum" or "minimum" are absolute.
 - 2. Tolerances shall be per CBC 11B-104.1.1 "Construction and manufacturing tolerances. All dimensions are subject to conventional industry tolerances except where the requirement is stated as a range with specific minimum and maximum end points."
- B. In addition to compliance with regulatory requirements, conduct construction operations in compliance with CFC Ch. 33 and NFPA 241, including applicable recommendations in Appendix A.
- C. When welding or doing other hot work, comply with CFC Ch. 35.
- D. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- E. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- F. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- G. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

- H. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

- a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
- 4. Verify that abandoned services serve only abandoned facilities.
- 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 - 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 - 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 - 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.

- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
 - 1. Coordinate installation or application of products for integrated Work.
 - 2. Uncover completed Work as necessary to install or apply products out of sequence.
 - 3. Remove and replace defective or non-conforming Work.
 - 4. Provide openings for penetration of utility services, such as plumbing, mechanical and electrical Work.
- E. After uncovering existing Work, inspect conditions affecting proper accomplishment of Work.
- F. Temporary Supports: Provide supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- G. Beginning of cutting or patching shall be interpreted to mean that existing conditions were found by Contractor to be acceptable.
- H. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- I. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 - 1. Use a diamond grit abrasive saw or similar cutter for smooth edges. Do not overcut corners.
- J. Restore work with new products in accordance with requirements of Contract Documents.
- K. Fit work neat and tight allowing for expansion and contraction.
- L. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- M. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- N. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- O. Finishing: Refinish surfaces to match adjacent and similar finishes as used for the Project.
 1. For continuous surfaces, refinish to nearest intersection or natural break.
 2. For an assembly, refinish entire unit.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or

system installation prior to start-up, and to supervise placing equipment or system in operation.

- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 PROJECT CLOSEOUT CONFERENCE

- A. Schedule and conduct a project closeout conference, at a time convenient to District 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 District, Commissioning Authority (CxA), Architect, and relevant consultants; Contractor and project 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. Commissioning.
 - c. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - d. Submittal of written warranties.
 - e. Coordination of separate contracts.
 - f. District's partial occupancy requirements.
 - g. Installation of District's furniture, fixtures, and equipment.
 - h. Responsibility for removing temporary facilities and controls.
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.12 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.

3.13 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.14 FINAL CLEANING

- A. Cleaning and Disposal Requirements, General: Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances and regulations, including environmental protection laws, rules and practices.
- B. Execute final cleaning prior to final project assessment.

1. Clean areas to be occupied by District prior to final completion before District occupancy.
- C. Substantial Completion Review Cleaning, General: Execute a thorough cleaning prior to Substantial Completion review by Architect and District. Employ experienced workers or professional cleaners for cleaning operations for Substantial Completion review.
- D. Use cleaning materials that are nonhazardous.
 1. Cleaning Agents and Materials: Use only those cleaning agents and materials which will not create hazards to health or property and which will not damage or degrade surfaces.
 - a. Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
 - b. Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.
 - c. Before use, review cleaning agents and materials with Construction Manager for suitability and compatibility. Use no cleaning agents and materials without approval as noted above.
 2. Cleaning Procedures: All cleaning processes, agents and materials shall be subject to Architect, District and/or Construction Manager review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or Construction Manager.
- E. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- F. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- G. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- H. Clean filters of operating equipment.
- I. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- J. Clean site; sweep paved areas, rake clean landscaped surfaces.
- K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.15 CLOSEOUT PROCEDURES

- A. Clean-Up Retainage:
 1. Five (5) percent of each Contractor's bid will automatically be held in abeyance in their contract schedule of values for clean-up.
 2. If in the Construction Manager's opinion the Contractor is maintaining a clean project, a pro-rata share of this clean-up budget will be paid monthly to the Contractor in accordance with their approximate aggregate percentage of completion of the project.

3. If a Contractor fails to heed written directives to clean-up during the course of the project, the work will be done at the Contractor's expense and a deductive change order will be written against their contract with the District.
 4. The establishment of this 5 percent budget in no way limits the cost for the Contractor to maintain a clean project.
- B. Make submittals that are required by governing or other authorities.
1. Provide copies to Architect and District.
- C. Accompany Architect, Construction Manager, and District Representative on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's comprehensive list of items to be completed or corrected.
1. As authorized by the District; Architect and Architect's and District's consultants, as appropriate, will attend a meeting at the Project site to review Contract closeout procedures and to review the list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
 2. This meeting shall be scheduled not earlier than 14 days prior to the date anticipated for the Substantial Completion review.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
1. Final Application for Payment: In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.
 2. Warranties, Bonds and Certificates: Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications and similar documents.
 3. Locks and Keys: Change temporary lock cylinders over to permanent keying and transmit keys to the District, unless otherwise directed or specified.
 4. Tests and Instructions: Complete start-up testing of systems, and instruction of the District's personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- F. Clearing and Cleaning: Prior to the Substantial Completion review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.
- G. Inspection and Testing: Prior to the Substantial Completion review, complete inspection and testing required for the Work, including securing of approvals by authorities having jurisdiction.
1. Complete all inspections, tests, balancing, sterilization and cleaning of plumbing and HVAC systems.

2. Complete inspections and tests of electrical power and signal systems.
 3. Complete inspections and tests of conveying (elevator or wheelchair lift) systems.
- H. District will occupy all of the building as specified in Section 01 10 00.
- I. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
1. Correction (Punch) List: Contractor shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
 - a. The punch list shall include all items to be completed or corrected prior to the Contractor's application for final payment.
 - b. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
 - c. Contractor shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural, Structural, Plumbing, Mechanical, Electrical, Fire Protection, Civil, and Landscape.
 - d. Architect, Architect's consultants and District's consultants, if in attendance, will conduct a brief walk-through of Project with the Contractor to review scope and adequacy of the punch list.
 - e. Verbal comments will be made to the Contractor by the Construction Manager, the Architect and the Architect's and District's consultants, if in attendance, during the walk-through. These comments will indicate generally the additions and corrections to be made to the punch list. Such comments shall not be considered to be comprehensive; Contractor shall use the comments as guidance in preparing the punch list for the Substantial Completion review.
 2. Substantial Completion Meeting: On a date mutually agreed by the District, Architect, and Contractor, a meeting shall be conducted at the Project site to determine whether the Work is satisfactory and complete for filing a Notice of Completion (Substantial Completion).
 - a. Contractor shall provide three working days notice to Architect for requested date of Substantial Completion meeting.
 - b. The Construction Manager, the Architect and the Architect's and District's consultants, as authorized by the District, will attend the Substantial Completion meeting.
 - c. In addition to conducting a walk-through of the facility and reviewing the punch list, the purpose of the meeting shall include submission of warranties, guarantees and bonds to the District, submission of operation and maintenance data (manuals), provision of specified extra materials to the District, and submission of other Contract closeout documents and materials as required and if not already submitted.

- d. The Construction Manager, the Architect and Architect's consultants, as appropriate, will conduct a walk-through of the facility with the Contractor and review the punch list.
 - e. Contractor shall correct the punch list and record additional items as may identified during the walk-through, including notations of corrective actions to be taken.
 - f. Contractor shall retype the punch list and distribute it within three working days to those attending the meeting.
 - g. If additional site visits by the Construction Manager, the Architect and the Architect's and District's consultants are required to review completion and correction of the Work, the costs of additional visits shall be reimbursed to the District by the Contractor by deducting such costs from the Final Payment.
- J. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.
 - K. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
 - 1. Architect's Certification of Substantial Completion:
 - a. When Architect determines that list of items to be completed and corrected (Punch List) is sufficiently complete for District to occupy Project for the use to which it is intended.
 - b. Architect will complete and issue to the District and Contractor a Certificate of Substantial Completion using:
 - 1) The American Institute of Architects Form G704 - Certificate of Substantial Completion
 - 2) or other form if directed by the District.
 - L. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.16 FINAL PAYMENT

- A. After completion of all items listed for completion and correction, after submission of all documents and products and after final cleaning, submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due.
- B. Payment will not be made until the following are accomplished:
 - 1. All Project Record Documents have been transferred and accepted by District.
 - 2. All extra materials and maintenance stock have been transferred and received by District.
 - 3. All warranty documents and operation and maintenance data have been received and accepted by District.
 - 4. All liens have been released or bonded by Contractor.
 - 5. Contractor's surety has consented to Final Payment.
 - 6. All documentation required by DSA has been completed.

3.17 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the District.

END OF SECTION

SECTION 01 73 56
ALTERATION AND MODERNIZATION EXECUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Alteration and Modernization work consisting of necessary demolition, dismantling, cutting, removal and repair of designated existing work and installation of new work as indicated herein and specified in applicable technical sections of the Project Manual.

1.02 ALTERATIONS

- A. Regulatory Requirements:
 - 1. Demolition work shall conform to:
 - a. California Fire Code, Chapter 14, "Fire Safety During Construction and Demolition."
 - b. California Building Code Chapter 33 - "Safeguards During Construction" and Chapter 34 - "Existing Structures."
- B. Verification of Existing Conditions:
 - 1. Drawings show the existing conditions, as they are believed to exist. Examine the existing conditions prior to alterations to existing buildings as indicated.
 - 2. Verify, at the site, conditions affecting the work.
 - a. Obtain accurate field dimensions of related areas, spaces, openings, levels, and items of adjacent work.
 - b. Before commencing work, report to Architect in writing, discrepancies between drawings and specifications and actual field conditions.
 - c. Commencement of work constitutes acceptance of all adjacent conditions affecting work of the section involved.
 - 3. Information provided represents to the best of the District's knowledge, conditions and materials to be found in this project.
 - a. The District assumes no responsibility whatsoever in respect to the sufficiency or accuracy of the Drawings or interpretation thereof.
 - b. There is no warranty or guarantee, either expressed or implied, that conditions and locations indicated are representative of those existing throughout the existing structures or that unforeseen developments may not occur.
- C. Continued Occupancy: Comply with Section 01 10 00 - Summary.
 - 1. District will continuously occupy buildings adjacent to areas of demolition operations. Conduct demolition operations in a manner that will minimize need for disruption of District's normal operations.
 - 2. Provide minimum 3 working days advance notice to District of demolition activities which might severely impact District's operations.
- D. Protection of Property, Public, Occupants (when applicable) and Workmen: Comply with 02 41 00 - Demolition.

1. Portions of existing structures where existing work is to be demolished or removed, and where new work is to be done, connections made, materials handled or equipment moved and related, shall be temporarily protected prior to start of demolition.
 2. Temporary protection shall be such that interior of existing structures will at all time be protected from dust fumes, smoke and weather inclemency. Comply with 01 50 00 - Temporary Facilities and Controls.
 3. Protect temporary openings in exterior walls by temporary weatherproof plywood closures. Comply with 01 50 00 - Temporary Facilities and Controls.
 4. Contractor will be held responsible for damage to existing structures and contents by reason of insufficiency of such protection. Comply with 01 40 00 - Quality Requirements
 5. Provide barricades, and maintenance and supervision thereof, in accordance with applicable Federal, State and local codes and their respective requirements, or as may be directed from time to time. Comply with 01 50 00 - Temporary Facilities and Controls.
- E. Transitions to Existing Work: Comply with 01 70 00 - Execution and Closeout Requirements.
1. Where alterations occur or new and old work are joined, immediately adjacent surfaces that are involved shall be cut, removed, patched, repaired or refinished, and left in as good condition as existed before commencing work.
 - a. Materials and workmanship employed in alterations involving new construction, unless otherwise indicated or specified, shall conform to no less than that of original work.
 2. Where remaining existing materials interfere with installation of new work, remove existing materials. After installation of new work is complete, or in conjunction with installation of new work as applicable, reinstall existing materials, patch and refinish, or provide new to match existing.
- F. Relocation of Existing Materials and Equipment: Comply with 01 70 00 - Execution and Closeout Requirements.
1. Relocate certain materials and equipment only as indicated or specified. Refinish certain existing surfaces as specified in applicable technical sections.
 2. Repair and refinish relocated materials and equipment as necessary to leave finished work in good condition.
- G. Salvage: Comply with 01 70 00 - Execution and Closeout Requirements and 02 41 00 - Demolition.
1. Salvaged materials occurring from work demolished or removed become property of Contractor unless otherwise noted in the Project Manual or Drawings to remain property of District, and shall be removed from project site.
 2. Exceptions:
 - a. Existing materials or equipment may be removed by District at any time prior to start of work.
 - b. Do not reuse in this project, materials and items removed from existing site or buildings, except with specific written approval by the Architect in each case, unless such removed material or item is specifically indicated or specified to be reused.

- c. Remove materials and equipment indicated to be salvaged for reinstallation and store to prevent damage, and reinstall as the work progresses.
 - 1) Do not reuse in this project, other materials and equipment removed from existing site or building, except with specific written approval by the Architect in each case.
 - d. Dismantled materials and items indicated to be reused must be in good condition without objectionable cracks, chips, splits, checks, dents, scratches, or other defects.
 - 1) Operating items shall operate properly.
 - 2) Notify Architect immediately of items found to be to the contrary.
 - e. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets and similar items remain the property of the District.
 - 1) Notify District if such items are encountered and obtain acceptance regarding method of removal and salvage.
- H. Submittals: Demolition Plan per 02 41 00 - Demolition.
 - 1. Before commencing alteration, removal and demolition work, prepare and submit for review by District, a schedule showing commencement, order and completion dates of various parts of work, including utilities disruptions and proposal to ensure uninterrupted progress of District's on-site operations.
- I. Utilities: Comply with 02 41 00 - Demolition.
 - 1. Before starting work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.), that will temporarily discontinue or disrupt service to existing buildings, provide two (2) working days notice to utility company, Architect and District, and obtain their approval in writing before proceed with this phase of Work.
 - 2. Disconnect, remove, and cap designated utility services, or those utility services required to be altered, within demolition areas.
 - 3. Mark locations of disconnected utilities. Identify and indicate capping locations on project record drawings.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR NEW WORK

- A. Comply with 01 60 00 - Product Requirements
- B. Products for New Work: Products specified in Part 2 - PRODUCTS of applicable technical sections of the Project Manual, shall be utilized for patching and extending Work.
- C. Type and Quality of Existing Products: Determine by inspection and testing Products where necessary, referring to existing construction as a standard.

PART 3 - EXECUTION

3.01 DEMOLITION

- A. Comply with 02 41 00 - Demolition.

- B. Conduct demolition to minimize interference with building or exterior areas to remain used or occupied, and surrounding landscaped areas.
 - 1. Maintain protected egress and access at all times.
- C. Demolish in an orderly and careful manner.
 - 1. Protect existing and remaining foundations and structural members.
 - 2. Perform cutting, drilling and removal of existing work with extreme care, with small tools in order not to jeopardize structural integrity of building or its parts. See also Section 01 70 00 - Execution and Closeout Requirements

3.02 MODERNIZATION

- A. The following is an expansion of some of the main reconstruction notes and specifications used on this project, and apply where and whenever described work is required.
- B. Concrete Floor or Slab:
 - 1. Repair existing concrete floor.
 - a. Fill cracks and voids with epoxy mortar per 03 01 00 - Maintenance of Concrete, 03 30 00 - Cast-in-Place Concrete, and 03 35 11 - Concrete Floor Finishes.
 - 2. Replacement of concrete slabs:
 - a. Use normal methods that will not crack or structurally disturb adjacent walls, partitions or slabs. Use power saws where possible.
- C. Concrete and Masonry: Comply with 01 70 00 - Execution and Closeout Requirements
 - 1. Demolish concrete and masonry in small sections.
 - a. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 - b. Saw concrete along straight lines to a depth of not less than 1-1/2 inches.
 - c. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face.
 - d. Break out the remainder of the concrete or masonry provided that the broken area is concealed in the finished work, and the remaining concrete or masonry is sound.
 - e. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete or masonry.
 - 2. Remove anchorages to at least 1/2-inch below the surface of concrete or masonry and patch depressions to provide a flush surface. Comply with 03 01 00 - Maintenance of Concrete.
 - a. Where surface will be concealed in the finished work, anchors may be cut flush with the surface.
- D. Cabinets, Countertops and Casework: Comply with 06 20 00 - Finish Carpentry and 06 41 00 - Architectural Wood Casework.
 - 1. New cabinets with or without sinks:
 - a. Provide new cabinets per Section 06 41 00 - Architectural Wood Casework.
 - b. Provide sink (where indicated) in cabinet with all rough and finish plumbing as scheduled on Drawings and as required in Division 22.

- c. Provide clearances for accessibility compliance where indicated.
- 2. New shelves:
 - a. Provide new shelves per Drawings and Section 06 41 00 - Architectural Wood Casework.
 - b. Prepare and paint shelves per Section 09 91 23 - Interior Painting.
- E. Walls and Partitions:
 - 1. Interior Partitions:
 - a. Remove partitions including finish, studs, plates and sills.
 - b. Where only a partial run is removed, cut back the finish material to the centerline of the next adjacent support to remain.
 - c. Leave remaining material with a clean terminal line with no loose adhering material. Where partitions have been installed on curbs, remove curbs and patch existing floor to receive new finish.
 - 2. Clean, patch and paint exposed walls, trims, columns, window frames, doors and door frames:
 - a. Painting shall include all surfaces and materials between the floor and the finish ceiling.
 - 1) Exceptions:
 - (a) Window glazing
 - (b) Anodized or other new pre-finished metal
 - (c) Vinyl wall covering
 - (d) Mechanical and electrical equipment
 - (e) Cabinets of stained finish and plastic laminate.
 - b. Prepare and patch existing gypsum wall board per Section 09 21 16 - Gypsum Board Assemblies.
 - 3. Gypsum board:
 - a. Cut back gypsum board to the centerline of the next adjacent support to remain. Leave remaining material with a clean terminal line with no loose adhering material.
 - 4. New tile backer cement board and new ceramic tile wainscot:
 - a. Conform to 09 21 16 - Gypsum Board Assemblies for installation of tile backer board.
 - b. Conform to 09 30 00 - Tiling for installation of new ceramic tile.
 - 5. Paint per 09 91 23 - Interior Painting.
- F. Openings:
 - 1. Doors: Comply with 08 11 13 - Hollow Metal Doors and Frames, 08 71 00 - Door Hardware, 09 91 13 - Exterior Painting, and 09 91 23 - Interior Painting
 - a. Re-Use of Existing Doors:
 - 1) Existing doors indicated to re-used, provide new hardware per District Standards.
 - 2) Remove door from frame, label door with the door number as indicated in the Drawings at the bottom sill edge of the door panel.

- 3) Where doors are indicated to be re-used in the new work, leave hardware attached to the door.
 - (a) Where this is not practical, place items of hardware in a labeled cloth bag attached to the door. Protect for re-installation.
 - 4) Stack removed doors in a method to protect from damage.
 - 5) When ready for re-installation see paragraph below for refinish of existing doors.
- b. New door frame, door and hardware:
- 1) Remove existing door, frame, wall section and other existing construction in order to install new door and frame.
 - 2) Construct new filler wall where required.
 - (a) Interior and exterior wall finishes to meet flush and match existing adjacent wall materials in type, texture and color.
 - (b) Frame new filler wall using materials to match existing, unless indicated otherwise.
 - (c) Provide secure, rigid head and jamb framing members to receive new door frames.
 - 3) Provide new frames per Specifications and Drawings.
 - 4) Provide new doors per Specifications and Drawings.
 - (a) Match door finish (paint or natural/stained) with existing doors to remain in the building/room.
 - 5) Prepare and paint or natural / stained finish doors and frames per Section 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting.
 - 6) Provide new door hardware as indicated on Drawings and 08 71 00 - Door Hardware.
 - 7) Relocate light switch where door opening is enlarged to fit new door.
- c. New doors to replace existing (including new hardware):
- 1) Remove existing door and hardware.
 - 2) Field verify existing clear opening dimension.
 - 3) Patch, fill and sand smooth holes in wood frames where old hardware has been removed. Position new hardware such as to avoid old locations and holes.
 - 4) At existing metal frames to remain, use new hinges to match hole mounting.
 - 5) Provide new door to fit in existing openings.
 - 6) Provide new door hardware per 08 71 00 - Door Hardware.
 - 7) Prepare and paint or natural / stained finish new doors and frames.
- G. Glazing: 08 11 13 - Hollow Metal Doors and Frames, 08 80 00 - Glazing, 09 91 13 - Exterior Painting, and 09 91 23 - Interior Painting
- H. Finishes:
1. Ceramic tile: Comply with 09 30 00 - Tiling.
 - a. New Ceramic Tile:
 - 1) Remove tile back to next full unit beyond the removal line.
 - 2) Saw cut setting bed at line to remain.

- 3) Remove individual damaged tile and backing mortar as required to provide for installation of new tile within the specified tolerances.
 - b. Remove existing finish floor to receive new ceramic tile floor.
 - c. Provide new slip resistant ceramic tile floor and base .
 - d. Steam clean all existing ceramic tile surfaces, where indicated to remain:
 - 1) Clean and seal existing ceramic tile.
2. New suspended ceiling systems: Comply with 09 51 00 - Acoustical Ceilings.
 - a. Remove existing ceiling materials where interfacing with the installation of new ceiling. Remove back to next full unit beyond removal line.
 - b. Remove individual panels where required for new light fixtures.
 - c. Store and protect units suitable for re-installation where indicated.
 - d. Install new ceiling.
 3. New Resilient Flooring and Rubber Base: Comply with 09 65 00 - Resilient Flooring.
 - a. Prepare floor in compliance with 09 05 61 - Common Work Results for Flooring Preparation.
 - b. Install new resilient tile flooring over existing concrete floor.
 - 1) Remove existing carpet or resilient floor finish, including adhesives.
 - c. Remove existing wood, rubber or vinyl base and mastic, patch and repair wall prior to installation of new base.
 - 1) Remove existing plaster grounds behind removed base and provide in-fill plaster finish; flush and smooth to receive new base.
 - d. Patching exposed above new base shall be finished to match surrounding wall.
 - e. Provide new topset base to match or existing as applicable.
 4. New carpet and base: Comply with 09 68 13 - Tile Carpeting and 09 65 00 - Resilient Flooring
 - a. Remove existing carpet, carpet mastic, edging strips and accessories, and thoroughly clean existing substrate.
 - b. Existing vinyl flooring is to remain beneath carpet to remain, unless noted otherwise.
 - c. Patch existing substrate (vinyl tile, concrete, etc.).
 - d. Provide new carpet and base.
 5. New fabric covered tack paneling: Comply with 10 11 00 - Visual Display Units.
 - a. Remove from wall existing conflicting surface treatment: trim, shelving, boards, electrical / mechanical devices etc.
 - b. Patch wall prior to installation of new tack paneling.
 - c. Provide new tack paneling.
 - d. Adjust existing recessed outlets and switches to be flush with tack panel.
 6. Patch, clean and paint existing ceiling: Comply with 09 21 16 - Gypsum Board Assemblies and 09 91 23 - Interior Painting
 - a. Patch, clean and paint existing gypsum board ceiling or soffit
 - b. At existing acoustic tile ceilings, replace only damaged tiles when indicated, clean and paint entire ceiling.

- c. Paint.
- I. Accessories and Components:
 - 1. New markerboards and tackboards: Comply with 10 11 00 - Visual Display Units.
 - a. Remove from wall existing conflicting surface treatment: Trim, shelving, boards, etc. Patch wall prior to installation of new boards.
 - b. Provide new markerboards and tackboards.
 - 2. New toilet compartments: Comply with 10 21 13.19 - Plastic Toilet Compartments.
 - a. Remove existing toilet compartments.
 - 1) Patch walls, floor and ceiling as required elsewhere in these notes.
 - b. Provide solid blocking or backing plates in existing walls.
 - c. Provide new toilet compartments
 - 3. New signage: Comply with 10 14 00 - Signage.
 - a. Provide interior and exterior signage as indicated on Drawings.
 - 4. New toilet accessories: Comply with 10 28 00 - Toilet Accessories.
 - a. Remove existing toilet accessories.
 - b. Provide backing plates or blocking in existing walls as indicated and/or specified, and patch walls.
 - c. Provide new toilet accessories as scheduled on Drawings and as specified in 10 28 00 - Toilet Accessories.
 - 5. New fire extinguisher cabinets: Comply with 10 44 00 - Fire Protection Specialties.
 - a. Remove existing fire extinguisher cabinets as indicated and patch walls flush, in preparation for new semi-recessed cabinets complete with fire extinguisher.

3.03 EXAMINATION

- A. Verify that demolition is complete, and areas are ready for execution of Work.
- B. Beginning of restoration Work will be interpreted to mean acceptance of existing conditions.

3.04 PREPARATION

- A. Cut, move or remove items as necessary for access for alterations, renovation and extension Work. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- C. Remove debris and abandoned items from area from concealed spaces.
- D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
- E. Close openings in exterior surfaces to protect existing work, and salvage items where applicable, from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.05 INSTALLATION

- A. Coordinate Work for alterations and renovations to expedite completion sequentially and to accommodate District occupancy.
- B. Designated areas: Complete in all respects including operational mechanical and electrical work.
- C. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring products and finishes to original or specified condition, including finish paint on exterior. Refer to Section 01 70 00 - Execution and Closeout Requirements.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. In addition to specified replacement of equipment and fixtures, restore existing and remaining plumbing, heating, ventilation, air conditioning, and electrical systems to full operational conditions.
- F. Install Products as specified in applicable Sections.

3.06 TRANSITIONS

- A. Where Work abuts or aligns with existing construction, perform a smooth and even transition. Patches shall match existing adjacent construction in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition is not possible, terminate existing surface along a straight line at a natural line of division. Refer to Section 01 70 00 - Execution and Closeout Requirements.
- C. Where a waterproofing system is interrupted, leave sufficient material to allow for overlapping of new material over or behind existing maintaining a watertight installation.

3.07 ADJUSTMENTS

- A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- B. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Architect's review.
- C. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
- D. Fit work at penetrations of surfaces as specified in Section 01 70 00 - Execution and Closeout Requirements.

3.08 REPAIR OF DAMAGED SURFACES

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.

3.09 FINISHES

- A. Finish surfaces as specified in applicable Sections.
- B. Finish patches to produce uniform finish and texture over entire area.

1. When finish cannot be matched, refinish entire surface to nearest intersections.

3.10 CLEANING

- A. In addition to cleaning specified in section 01 70 00 - Execution and Closeout Requirements, clean District-occupied areas of existing construction affected by construction activities.
- B. Do not burn or bury materials on site.

3.11 DEMOLITION RESTRICTIONS

- A. Noise Abatement:
 1. Limit noise to a reasonable level as related to specific items of equipment used and their hours of use.
 2. This does not preclude use of mechanical equipment, i.e. jack hammers, power-driven fasteners.
- B. Do not operate air compressors inside of existing buildings.
- C. Drilling or cutting of columns, beams, joists, girders, or other structural support elements not permitted, unless specifically approved by Architect.

3.12 DISPOSAL OF DEMOLISHED MATERIALS

- A. Do not burn or bury materials on site.
- B. Immediately remove demolished materials from site or stockpile where directed if designated for re-use.
- C. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.
- D. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Comply with the requirements Section 5.408 of the California Green Building Standards Code.
 - 1. Recycle and/or salvage for reuse a minimum of 65percent of the nonhazardous construction and demolition waste in accordance with Section 504.8.1.1, 5.408.1.2, or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.
- B. District requires that this project generate the least amount of trash and waste possible.
- C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
 - 6. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
 - 7. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
 - 8. Asphalt paving: May be recycled into paving for project.
 - 9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 10. Glass.
 - 11. Gypsum drywall and plaster.
 - 12. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 13. Roofing.
 - 14. Paint.
 - 15. Plastic sheeting.
 - 16. Rigid foam insulation.

17. Windows, doors, and door hardware.
18. Plumbing fixtures.
19. Mechanical and electrical equipment.
20. Fluorescent lamps (light bulbs).
21. Acoustical ceiling tile and panels.
22. Materials which could be hazardous and subject to special disposal regulations include but are not limited to the following: CalGreen Section 5.408.2
 - a. Lead-Based Paint
 - b. Asbestos: Found in older pipe insulation, asphalt floor tiles, linoleum, insulation, etc.
 - c. Polychlorinated Biphenyls (PCBs):
 - 1) Found in electrical oil filled equipment manufactured prior to 1978 such as transformers, switches and fluorescent lamp ballasts.
 - 2) Also found in adhesive, sealant, caulk, glazing putty, roofing material, pesticide vehicle, ink, paper, fabric dye, gaskets, and hydraulic fluid.
 - d. HVAC Refrigerants: Containing Fluorinated and Chlorinated compounds.
 - e. Drinking Fountain Refrigerants: Containing Fluorinated and Chlorinated compounds.
 - f. Fluorescent Light Tubes: Contain mercury.
 - g. EXIT signs and Smoke Detectors: May contain unregulated, radioactive tritium. · Required to be returned to manufacturer.
 - h. Contaminated Soils.
 - i. Pressure Treated Lumber.
- F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
 1. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements. CalGreen Section 5.408.1.1.
- H. The following sources may be useful in developing the Waste Management Plan:
 1. California Recycling Department, at www.bsc.ca.gov/Home/CALGreen.aspx.
 2. General information contacts regarding construction and demolition waste:
 - a. EPA Construction and demolition (C&D) debris website: www.epa.gov/epawaste/conservation/imr/cdm/.
 - b. Directory of Wood-Framed Building Deconstruction and Reused Building Materials Companies: www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr150.pdf.
 - c. Additional resources to be developed by Contractor with assistance from District and Contractor, as requested.
 3. Recycling Haulers and Markets: The source list below contains local haulers and markets for recyclable materials. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
 - a. CAL-MAX: www.calrecycle.ca.gov/calmax/.

- 1) A free service designed to help businesses find markets for non-hazardous materials they have traditionally discarded.
- b. General Recycling/Reuse Centers: For information on qualified local solid waste haulers contact the California Department of Resources Recycling and Recovery - CalRecycle. The website lists wastes recycling facilities in counties throughout the State of California.
 - 1) <http://www.calrecycle.ca.gov/default.asp>
- I. Methods of trash/waste disposal that are not acceptable are:
 1. Burning on the project site.
 2. Burying on the project site.
 3. Dumping or burying on other property, public or private.
 4. Other illegal dumping or burying.
 5. Incineration, either on- or off-site.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
 1. Debris that is not hazardous as defined in CalGreen Section 5.408.2 and California Code of Regulations, Title 22, Section 66261.3 et seq.
 2. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel.
 3. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.
- 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. Diversion: Avoidance of demolition and construction waste sent to landfill or incineration. Diversion does not include using materials for landfill, alternate daily cover on landfills, or materials used as fuel in waste-to-energy processes.
- E. Enforcement Agency (EA). Enforcement agency as defined in CA Public Resources Code 40130.
- F. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- G. Landfill, Inert waste or Inert Disposal Facility:

1. A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.
- H. Landfill, Class III:
1. A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations.
 2. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Enforcement Agency (EA).
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- K. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- L. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- M. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- N. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- O. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- P. Recycling Center: A facility that receives only C&D material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.
- Q. Return: To give back reusable items or unused products to vendors for credit.
- R. Reuse: To reuse a construction waste material in some manner on the project site.
- S. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- T. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- U. Separated for Reuse:
1. Materials, including commingled recyclables.
 2. Separated or kept separate from the solid waste stream for the purpose of:
 - a. Additional sorting or processing those materials for reuse or recycling.
 - 1) In order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products.
 - b. Products shall meet the quality standards necessary to be used in the marketplace.

- c. Includes materials that have been “source separated”.
- V. Solid Waste:
 - 1. All putrescible and nonputrescible solid, semisolid, and liquid wastes, including:
 - a. Garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes.
 - b. Abandoned vehicles and parts thereof.
 - c. Discarded home and industrial appliances.
 - d. Dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste.
 - e. Manure, vegetable or animal solid and semisolid wastes.
 - f. Other discarded solid and semisolid wastes.
 - 2. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.
- W. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
 - 1. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.
- X. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- Y. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- Z. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- AA. Waste Hauler: A company that possesses a valid permit from the local waste management authority to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the locality.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Submit Waste Management Plan within 30 calendar days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
 - 1. Submit four copies of CWMP for review.
 - a. Contractor's Construction Waste and Recycling Plan must be approved by the Architect and Construction Manager prior to the start of Work.
 - 2. Approval of the Contractor's CWMP shall not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.
- C. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - a. Inert materials shall achieve a construction waste diversion rate of at least 95 percent.
 - 1) These materials include, but are not limited to, concrete, asphalt and rock.
 - 2) Earthwork is not included.
 - 3) Excavated soil shall not be included in any of the calculations used to ensure compliance with this specification section.
 - b. The overall diversion rate must be based on weight.
 - c. The diversion rate of individual materials can be measured in either weight or volume, but the rate shall be converted into the units selected for calculating the overall diversion rate.
 - 1) All individual material diversions must be converted to a consistent set of units when calculating the overall diversion rate for the all reports and submittals required for the Work.
 - d. Conversion rate numbers shall be based on standard conversion rate data for construction projects provided by the California Integrated Waste Management Board (CIWMB). This data is available at the following internet location, <http://www.calrecycle.ca.gov/LGCentral/Library/dsg/ICandD.htm>.
 2. Submit Report on a form acceptable to District.
 3. Landfill Disposal: Include the following information:
 - a. Identification of material.

- b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, District, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
 - 2. Provide containers as required.
 - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 5. Locate enclosures out of the way of construction traffic.
 - 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 - 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of

identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

3.03 DISPOSAL OPERATIONS AND WASTE HAULING

- A. Remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except for items or materials to be salvaged, recycled, or otherwise reused.
 - 2. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on site.
 - 3. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority.
 - 4. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials.
 - 5. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
 - 6. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 7. Do not burn or bury waste materials on or off site. Appropriate on-site topical application of ground gypsum or wood, or use of site paving as granulated fill is considered reuse, not waste.

3.04 PLAN AND REPORT FORMS

- A. See suggested forms on the following pages.

END OF SECTION

CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

(Submit After Award of Contract and Prior to Start of Work)

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:				State:		Zip:
Phone: ()				Fax: ()		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:		TO:		
Reuse, Recycling or Disposal Processes To Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert G = Green Materials
D = Drywall		P/C=Paper/Cardboard		W/C = Wire/Cable		S= Soils (Non Hazardous)
M/C = Miscellaneous Construction Debris		R = Reuse/Salvage		W = Wood		O = Other (describe)
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion						

CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

Continued

SECTION II - DISPOSED MATERIALS						
Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

SECTION III - TOTAL MATERIALS GENERATED			
This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)			
	Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled	0	0	0
b. Total Disposed	0	0	0
c. Total Generated	0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION			
Add totals from Section I + Section II			
	Tons	Cubic YD	Other Wt.
a. Materials Re-Used and Recycled	0		
b. Materials Disposed	0		
c. Total Materials Generated (a. + b. = c.)	0	0	0
d. Landfill Diversion Rate (Tonnage Only)*			

* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)	c. Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)
a. Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)	d. Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)
b. Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)	e. Drywall Scrap: .20
	f. Wood Scrap: .16

CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

(Submit With Each Progress Payment)

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:				State:		Zip:
Phone: ()				Fax: ()		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:		TO:		
Reuse, Recycling or Disposal Processes to Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt C = Concrete M = Metals I = Mixed Inert G = Green Materials						
D = Drywall P/C=Paper/Cardboard W/C = Wire/Cable S= Soils (Non-Hazardous)						
M/C = Miscellaneous Construction Debris R = Reuse/Salvage W = Wood O = Other (describe)						
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion						

CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

Continued

SECTION II - DISPOSED MATERIALS						
Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal						

SECTION III - TOTAL MATERIALS GENERATED			
This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)			
	Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled			
b. Total Disposed			
c. Total Generated			

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION			
Add totals from Section I + Section II			
	Tons	Cubic YD	Other Wt.
a. Materials Re-Used and Recycled			
b. Materials Disposed			
c. Total Materials Generated (a. + b. = c.)			
d. Landfill Diversion Rate (Tonnage Only)*			

* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons
(Use when scales are not available)

- a. Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)
- b. Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

c. Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

d. Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

e. Drywall Scrap: .20

f. Wood Scrap: .16

SECTION 01 76 10
TEMPORARY PROTECTIVE COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary protective coverings for installed floors, walls, and other surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Coordination of requirements for materials specified in this section.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard.
- B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes available; and installation instructions.
- C. Shop Drawings: Indicate existing finished surfaces to be protected.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Temporary Protective Coverings:
 - 1. Fortifiber Building Systems Group: fortifiber.com.
 - 2. Protex Products: www.protex-products.com.
 - 3. Surface Shields, Inc: www.surfaceshields.com.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL

- A. Provide materials that are easily removed without damage to the surfaces covered and with the following characteristics:
 - 1. Water resistant.
 - 2. Vapor permeable.
 - 3. Impact resistant.
 - 4. Slip resistant.

5. Flame retardant.

2.03 MATERIALS

A. Sheet Materials:

1. Corrugated polypropylene sheet.
2. Recycled paperboard/plastic composite sheet.
3. Recycled paperboard sheet.
4. Wood Hardboard: ANSI A135.4, tempered, 1/4 inch thick nominal.
5. Plywood, 1/2 inch thick nominal.
6. Fiberboard: ASTM C208, 1/2 inch thick nominal.
7. Water Vapor Permeability: Greater than 0.1 perms when tested in accordance with ASTM E96/E96M.
8. Flame Retardance: Meet requirements of NFPA 701.
9. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

B. Rolled Materials:

1. Self-adhering polyethylene film.
2. Recycled cellulose fiberboard paper.
3. Laminated glass fiber reinforced kraft paper.
4. Rosin coated paper.
5. Water Vapor Permeability: Greater than 0.1 perms when tested in accordance with ASTM E96/E96M.
6. Flame Retardance: Meet requirements of NFPA 701.
7. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

C. Corner and Door Jamb Protection Materials:

1. Cardboard, shaped specifically for application.
2. PVC plastic.

D. Tape: Type recommended by protective covering material manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Remove dirt and debris from surfaces to be protected.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Trim or overlap sheet materials to fit area to be covered.
- C. Roll out and cut rolled materials to fit area to be covered.

- D. Tape seams. Avoid taping directly to finished surfaces.
- E. Stretch self-adhering film materials to completely cover surface.
- F. Install door jamb protection to full height of opening.
- G. Position corner protection 4 inches above finished floor to 96 inches high.

3.03 REMOVAL

- A. Remove protective coverings prior to Date of Substantial Completion. Reuse or recycle materials if possible.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Owner issued Bidding Instructions and General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 45 33 - Code-Required Special Inspections: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- D. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- E. Individual Product Sections: Specific requirements for operation and maintenance data.
- F. Individual Product Sections: Warranties required for specific products or Work.
 - 1. Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to District.

1.03 DEFINITIONS

- A. Warranty: Assurance to District by Contractor, installer, supplier, manufacturer or other party responsible as warrantor, for the quantity, quality, performance and other representations of a product, system service of the Work, in whole or in part, for the duration of the specified period of time.
- B. Guarantee: Assurance to District by Contractor or product manufacturer or other specified party, as guarantor, that the specified warranty will be fulfilled by the guarantor in the event of default by the warrantor.
- C. Standard Product Warranty: Preprinted, written warranty published by product manufacturer for particular products and specifically endorsed by the manufacturer to the District.
- D. Special Project Warranty: Written warranty required by or incorporated into Contract Documents, to extend time limits provided by standard warranty or to provide greater rights for District.
- E. Correction Period: As defined in the Conditions of the Contract, Correction Period shall be synonymous with "warranty period", "guarantee period" and similar terms used in the Contract Specifications.

1.04 SUBMITTALS

- A. Advance Submittals: For equipment and systems, or component parts of systems, put into service during construction and operated by District, submit documents within ten days of start of operation by District.
- B. Final Completion Submittals: Prior to application for final payment, Contractor shall submit 3 copies the following:
 - 1. Agency Document Submittals: Submit to District all documents required by authorities having jurisdiction, including serving utilities and other agencies. Submit original versions of all permit cards, with final sign-off by inspectors. Submit all certifications of inspections and tests.
 - a. Contractor shall also complete all required contractor forms and obtain DSA approval of these same forms. Comply with "Final Certification of Construction" per Title 24 Part 1 section 4-339.
 - 1) Form-6.C: Verified Report – Contractor: From each Contractor having a contract with the District.
 - 2. Final Specifications Submittals: Submit to District all documents and products required by Specifications to be submitted, including the following:
 - a. Project record drawings and specifications.
 - b. Operating and maintenance data.
 - c. Guarantees, warranties and bonds.
 - d. Keys and keying schedule.
 - e. Spare parts and extra stock.
 - f. Test reports and certificates of compliance.
 - 3. Certificates of Compliance and Test Report Submittals: Submit to District certificates and reports as specified and as required by authorities having jurisdiction, including the following:
 - a. Sterilization of water systems.
 - b. Sanitary sewer system tests.
 - c. Gas system tests.
 - d. Lighting, power and signal system tests.
 - e. Ventilation equipment and air balance tests.
 - f. Fire sprinkler system tests.
 - g. Fire detection system, smoke alarms and dampers.
 - h. Roofing inspections and tests.
 - 4. Lien and Bonding Company Releases: Submit to District, with copy to Architect, evidence of satisfaction of encumbrances on Project by completion and submission of The American Institute of Architects Forms:
 - a. G706 - Contractor's Affidavit of Payment of Debts and Claims;
 - b. G706A - Contractor's Affidavit of Release of Liens;
 - c. (if applicable) G707 - Consent of Surety;
 - d. or forms as agreed to by the District.
 - e. Comply also with other requirements of District, as directed.

- f. All signatures shall be notarized.
- 5. Subcontractor List: Submit two copies to District and two copies to Architect of updated Subcontractor and Materials Supplier List.
- 6. Warranty Documents: Prepare and submit to District all warranties and bonds as specified in Contract General Conditions and this Section.
- C. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- D. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by District, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- E. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with District's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

1.05 WARRANTIES AND GUARANTEES

- A. General:
 - 1. Provide all warranties and guarantees with District named as beneficiary.
 - 2. For equipment and products, or components thereof, bearing a manufacturer's warranty or guarantee that extends for a period of time beyond the Contractor's warranty and guarantee, so state in the warranty or guarantee.
- B. Provisions for Special Warranties: Refer to Conditions of the Contract for terms of the Contractor's special warranty of workmanship and materials.
- C. General Warranty and Guarantee Requirements:
 - 1. Warranty shall be an agreement to repair or replace, without cost and undue hardship to District, Work performed under the Contract which is found to be defective during the Correction Period (warranty or guarantee) period.
 - 2. Repairs and replacements due to improper maintenance or operation, or due to normal wear, usage and weathering are excluded from warranty requirements unless otherwise specified.

- D. Specific Warranty and Guarantee Requirements: Specific requirements are included in product Specifications Sections of Divisions 03 through 33, including content and limitations.
- E. Disclaimers and Limitations:
 - 1. Manufacturer's disclaimers and limitations on product warranties and guarantees shall not relieve Contractor of responsibility for warranty and guarantee requirements.
 - 2. This applies to the Work that incorporates such products, nor shall they relieve suppliers, manufacturers, and installers required to countersign special warranties with Contractor.
- F. Related Damages and Losses: When correcting warranted Work that has been found defective, remove and replace other Work that has been damaged as a result of such defect or that must be removed and replaced to provide access for correction of warranted Work.
- G. Reinstatement of Warranty:
 - 1. When Work covered by a warranty has been found defective and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
 - 2. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- H. Replacement Cost:
 - 1. Upon determination that Work covered by a warranty has been found to be defective, replace or reconstruct the Work to a condition acceptable to District, complying with applicable requirements of the Contract Documents.
 - 2. Contractor shall be responsible for all costs for replacing or reconstructing defective Work regardless of whether District has benefited from use of the Work through a portion of its anticipated useful service life.
- I. District's Recourse:
 - 1. Written warranties made to the District shall be in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which the District can enforce such other duties, obligations, rights, or remedies.
 - 2. Rejection of Warranties:
 - a. The District reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- J. Warranty as Condition of Acceptance:
 - 1. District reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment shall be required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Record Documents are to be maintained and submitted in searchable live electronic format (PDF).
 - 1. Develop in compliance with Section 01 30 00 - Administrative Requirements.
 - 2. Acceptable markup software:
 - a. Adobe Acrobat Professional.
 - b. Bluebeam Revu.
- B. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings.
 - 2. Project Manual with Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- C. Ensure entries are complete and accurate, enabling future reference by District.
- D. Store record documents separate from documents used for construction.
- E. Record information concurrent with construction progress.
- F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
 - 4. Provide copies of all approved addenda, directives, corrections, and change orders affecting the associated project.
 - a. These copies shall be included with the "Bid Set" and/or "Record Set" listed above and formatted as detailed above.
- G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Reproducible set of Contract Drawings will be provided to Contractor by District through Architect or Construction Manager.
 - 2. Measured depths of foundations in relation to finish first floor datum.
 - 3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes of dimension and detail.
6. Details not on original Contract drawings.
 - a. Application of copies of details produced and provided by Architect during construction will be accepted.
- H. Submission: Submit Record Documents in searchable (live text and redlines mark-ups; not scanned) PDF format to Architect prior to final Application for Payment.
 1. Maintain one additional paper copy and one in PDF format (on CD) of the fire suppression and fire protection detection system drawings and specifications at the building premises.
 - a. One copy is to be kept on site for a period of three years to comply with CFC section 901.6.2.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
 - C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
 - D. Include color coded wiring diagrams as installed.
 - E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - G. Provide servicing and lubrication schedule, and list of lubricants required.
 - H. Include manufacturer's printed operation and maintenance instructions.
 - I. Include sequence of operation by controls manufacturer.
 - J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - K. Provide control diagrams by controls manufacturer as installed.
 - L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
 - M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 1. Parts Data:
 - a. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams as necessary for service and maintenance.
 - b. Include complete nomenclature and catalog numbers for consumable and replacement parts.
 - c. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in stock by the District or operator.
 - O. Include test and balancing reports.
 - P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

1. Provide duplicate electronic formatted (PDF) versions of the O&M binder for record purposes. Organize the same as the printed versions.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 1. Project Directory.
 2. Table of Contents, of all volumes, and of this volume.
 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.
 4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Project Warranty and Guarantee Forms:
 1. Example forms for special Project warranties and guarantees are included at the end of this Section.

2. Prepare written documents utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer.
 - a. Submit a draft to District through Architect for approval prior to final execution.
 3. Refer to product technical Sections for specific content requirements, and particular requirements for submittal of special warranties.
 4. Prepare standard warranties and guarantees, excepting manufacturers' standard printed warranties and guarantees, on Contractor's, subcontractor's, material supplier's, or manufacturer's own letterhead, addressed to District.
 5. Warranty and guarantee letters shall be signed by all responsible parties and by Contractor in every case, with modifications only as approved in advance by District to suit the conditions pertaining to the warranty or guarantee.
- C. Manufacturer's Guarantee Form:
1. Manufacturer's guarantee form may be used in lieu of special Project form included at the end of this Section.
 2. Manufacturer's guarantee form shall contain appropriate terms and identification, ready for execution by the required parties.
 3. If proposed terms and conditions restrict guarantee coverage or require actions by District beyond those specified, submit draft of guarantee to District through Architect for review and acceptance before performance of the Work.
 4. In other cases, submit draft of guarantee to District through Architect for approval prior to final execution of guarantee.
- D. Signatures: Signatures shall be by person authorized to sign warranties, guarantees and bonds on behalf of entity providing such warranty, guarantee or bond.
- E. Co-Signature: All installer's warranties and bonds shall be co-signed by Contractor. Manufacturer's guarantees will not require co-signature.
- F. Verify that documents are in proper form, contain full information, and are notarized.
- G. Co-execute submittals when required.
- H. Retain warranties and bonds until time specified for submittal.
- I. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- J. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
1. If more than one volume of warranties, guarantees and bonds is produced, identify volume number on binder.
- K. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- L. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

M. Form of Warranty and Bond Submittals:

1. Prior to final Application and Certificate for Payment, compile two copies of each required warranty, guarantee and bond, properly executed by Contractor, or jointly by Contractor, subcontractor, supplier, or manufacturer.
2. Collect and assemble all written warranties and guarantees into binders and deliver binders to District for final review and acceptance.
3. Include Table of Contents for binder, neatly typed, following order and Section numbers and titles as used in the Project Manual.
4. Provide heavy paper dividers with celluloid or plastic covered tabs for each separate warranty.
 - a. Mark tabs to identify products or installation, and Section number and title.
5. Include on separate typed sheet, if information is not contained in warranty or guarantee form, a description of the product or installation, and the name, address, telephone number and responsible person for applicable installer, supplier and manufacturer.
6. When operating and maintenance data manuals are required for warranted construction, include additional copies of each required warranty and guarantee in each required manual.
 - a. Coordinate with requirements listed in the prior articles for operating and maintenance data manuals.

3.07 TIME OF WARRANTY AND BOND SUBMITTALS

A. Submission of Preliminary Copies:

1. Unless otherwise specified, obtain preliminary copies of warranties, guarantees and bonds within ten days of completion of applicable item or Work.
2. Prepare and submit preliminary copies for review as specified herein.

B. Submission of Final Copies:

1. Submit fully executed copies of warranties, guarantees and bonds within ten days of date identified in Certificate of Completion but no later than three days prior to date of final Application for Payment.

C. Date of Warranties and Bonds:

1. Unless otherwise directed or specified, commencement date of warranty, guarantee and bond periods shall be the date established in the Certificate of Completion.
2. Warranties for Work accepted in advance of date stated in Certificate of Completion:
 - a. When a designated system, equipment, component parts or other portion of the Work is completed and occupied or put to beneficial use by District:
 - 1) By separate agreement with Contractor, prior to completion date established in the Certificate of Completion, submit properly executed warranties to District within ten days of completion of that designated portion of the Work.
 - 2) List date of commencement of warranty, guarantee or bond period as the date established in the Certificate of Completion.

3. Warranties for Work not accepted as of date established in the Certificate of Completion:
 - a. Submit documents within ten days after acceptance, listing date of acceptance as beginning of warranty, guarantee or bond period.
- D. Duration of Warranties and Guarantees:
 1. Unless otherwise specified or prescribed by law, warranty and guarantee periods shall be not less than the Correction Period required by the Conditions of the Contract.
 2. In no case, the period is to be less than one year from the date established for completion of the Project in the Certificate of Completion.
 3. See product Specifications Sections of the Project Manual for extended warranty and guarantee beyond the minimum one year duration.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of District personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Landscape irrigation.
 - 6. Items specified in individual product Sections.
- C. Training of District personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Training Plan: District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Each Sub, Design-Builder SubContractor and vendor responsible for training submits a written training plan to the Architect and District Representative for review and approval prior to training.
 - 2. Submit to Architect for transmittal to District.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - 1) Equipment list
 - c. Name of firm and person conducting training; include qualifications.

- d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - 1) Agenda and subjects (design intent, equipment inspections, modes of operation, system interactions, troubleshooting, preventative maintenance, etc.)
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - 1) The approved O&M manuals shall be used during the training for equipment specific references.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
- 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
- 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for District's subsequent use.
- 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
- 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TRAINING OF OWNER PERSONNEL

- A. The Contractor and Design-Builder SubContractors shall be responsible for training coordination and scheduling and for ensuring that training is completed.
- B. The specific training requirements of District personnel by Subs, Design-Builder SubContractors and vendors is specified in the Division in which the equipment is specified.
- C. For primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3.02 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by District.
- B. Demonstration may be combined with District personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.03 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. District will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of District's personnel to be trained; re-schedule training sessions as required by District; once schedule has been approved by District failure to conduct sessions according to schedule will be cause for District to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:

1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
 - 1. Demolition and removal of existing site improvements within Project area, as indicated on Drawings and as necessary to accomplish the Work, including:
 - a. Asphaltic concrete and portland cement concrete paving.
 - b. Abandoned underground utility lines outside of utility easement.
 - c. Pavement cutting and removal.
 - d. Debris removal.
 - 2. Handling and disposal of removed materials.
 - 3. Dewatering of excavations as necessary to control surface and sub-surface water.
- B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Description of items to be removed by District.
- C. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- D. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- G. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.
- B. CFC Ch. 33 - Fire Safety During Construction and Demolition.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 DEFINITIONS

- A. Remove: Remove and legally dispose of items, except those identified for use in recycling, re-use, and salvage programs.
- B. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter

ecological balances of importance to human or animal life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural or historical purposes.

- C. Inert Fill: A permitted facility that accepts inert waste such as asphalt and concrete exclusively for the purpose of disposal.
 - 1. Inert Solids/Inert Waste: Non-liquid solid waste including, but not limited to, soil and concrete, that does not contain hazardous substances or soluble pollutants at concentrations in excess of water-quality standards established by a regional water board and does not contain significant quantities of decomposable solid waste.
- D. Class III Landfill: A landfill that accepts non-hazardous materials such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the State of California.
- E. Demolition Waste: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel. The materials may include rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.
- F. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.
- G. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- H. Reuse: The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- I. Solid Waste: All putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Construction Conference: Conduct a pre-construction conference one week prior to the start of the work of this section; require attendance by all affected trades.
- B. Convene a conference at the Project site 3 days prior to starting demolition to review the Drawings and Specifications, requirements of authorities having jurisdiction, instructions and requirements of serving utilities, sequencing and interface considerations and project conditions.
- C. Conference shall be attended by Construction Manager, supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.

- D. Submit minutes of meeting to District, Project Inspector and Architect, for Project record purposes.
- E. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
 - 1. Refer to sequence requirements specified in Section 01 10 00 - Summary; and construction progress schedule requirements specified in Section 01 30 00 - Administrative Requirements.

1.06 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain property of Grossmont Union High School District, demolished materials shall become the Contractor's property and shall be removed, recycled, or disposed from Project site in an appropriate and legal manner.
 - 1. Arrange a meeting no less than ten (10) days prior to demolition with the District or Construction Manager and other designated representatives to review any salvageable items to determine if District wants to retain ownership, and discuss Contractor's Waste Management and Recycling Plan.

1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Areas for temporary construction and field offices.
 - 2. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
- D. Demolition phase:
 - 1. Proposed dust-control measures.
 - 2. Proposed noise-control measures.
 - 3. Schedule of demolition activities indicating the following:
 - a. Detailed sequence of demolition and removal work, including start and end dates for each activity.
 - b. Dates for shutoff, capping, and continuation of utility services.
 - 4. If hazardous materials are encountered and disposed of, landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - 5. Contractor's Waste Management and Recycling Plan: See Section 01 74 19 - Construction Waste Management and Disposal.
 - a. This plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

6. Contractor's Reuse, Recycling, and Disposal Report: See Section 01 74 19 - Construction Waste Management and Disposal.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
 1. Record drawings: Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.08 SUBMITTALS

- A. Demolition and Removal Procedures and Schedule: Submit for Project record only.
- B. Project Record Drawings: Submit in accordance with provisions specified in Section 01 78 00 - Closeout Submittals. Indicate verified locations of underground utilities and storm drainage system on project record drawings.

1.09 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 1. Minimum of 5 years of documented experience.

1.10 SCHEDULING

- A. Schedule Work to precede new construction.
- B. Describe demolition removal procedures and schedule.
- C. Perform work between the hours of 8am and 5pm, subject to noise abatement regulations and District's approval for noise considerations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

- A. Remove paving and curbs as required to accomplish new work.
- B. Remove other items indicated, for salvage, relocation, and recycling.
- C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Conform to the relevant Article of the General Conditions, South Coast Air Quality Management District and other applicable regulatory procedures when discovering hazardous or contaminated materials.
- B. Selective Demolition of Site and Building Elements:
 1. Use techniques acceptable to authorities having jurisdiction and which will achieve intended results and provide protection of surrounding features to remain.

2. Some items may have been demolished prior to Work of this Contract. Verify existing conditions prior to start of demolition. If items are or have been demolished contact the Architect.
 3. Some items may require postponement of demolition until late in Contract Time period.
 4. Phase demolition as necessary to provide adequate interfacing of related Work.
 5. Demolish in an orderly and careful manner. Protect existing foundations, retaining walls, utility structures, other structures and finish materials to remain.
- C. Field Measurements and Conditions:
1. Survey existing conditions and correlate with requirements indicated to determine extent of demolition and recycling required.
 2. In addition to provisions of the Conditions of the Contract, verify dimensions and field conditions prior to construction. Verify condition of substrate and adjoining Work before proceeding with demolition Work. If conflict is found notify Construction Manager, Project Inspector and Architect.
- D. Comply with other requirements specified in Section 01 70 00.
- E. Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Obtain and pay for all permits required.
- F. Environmental Controls
1. Comply with federal, state and local regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment and noise pollution.
 2. Confine demolition activities to areas defined by public roads, easements, and work area limits indicated on the drawings.
 3. Temporary Construction: Remove indications of temporary construction facilities, such as haul roads, work areas, structures, stockpiles or waste areas.
 4. Water Resources: Comply with applicable regulations concerning the direct or indirect discharge of pollutants to underground and natural surface waters.
 - a. Oily Substances: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water in such quantities as to affect normal use, aesthetics, or produce a measurable ecological impact on the area.
 - 1) Store and service construction equipment at areas designated for collection of oil wastes.
 5. Dust Control, Air Pollution, and Odor Control: Prevent creation of dust, air pollution and odors.
 - a. Use temporary enclosures and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - b. Store volatile liquids, including fuels and solvents, in closed containers.
 - c. Properly maintain equipment to reduce gaseous pollutant emissions.
 6. Noise Control: Perform demolition operations to minimize noise.
 - a. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary to comply with the requirements of this Contract.

- G. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
 2. Comply with applicable requirements of NFPA 241 and CFC Ch. 33.
 3. Use of explosives is not permitted.
 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - a. Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
 - 1) Retain a licensed and qualified civil or structural engineer to provide analysis, including calculations, necessary to ensure the safe execution of the demolition work.
 - b. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.
 - c. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.
 5. Provide, erect, and maintain temporary barriers and security devices.
 - a. Provide, erect, and maintain temporary barriers, safety and security devices , for protection of streets, sidewalks, curbs, adjacent property and the public.
 - b. Protection: Protect existing construction and adjacent areas with temporary barriers and security devices in accordance with requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 1) Review location and type of construction of temporary barriers with District and/or the Construction Manager.
 - 2) Barriers shall control dust, debris and provide protection for persons occupying and using adjacent facilities.
 - 3) Maintain protected egress and access at all times, in accordance with requirements of authorities having jurisdiction and with permission of DSA (AHJ having jurisdiction).
 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 8. Do not close or obstruct roadways or sidewalks without permit.
 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- H. Do not begin removal until receipt of notification to proceed from District.
- I. Do not begin removal until built elements to be salvaged or relocated have been removed.

- J. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
 - 4. Protect existing landscaping materials, appurtenances, structures and items that are not to be demolished, or are on adjacent property.
 - 5. Mark location of utilities.
- K. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- L. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- M. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00 - Product Requirements.
- N. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- O. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
- P. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to District.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to District.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
- I. Utility Lines, Posts and Structures:

1. Work by Utility: Posts, conductors, guy wires, boxes, structures and equipment shown to be cleared or removed by the responsible utility company or agency shall be considered work under a separate contract.
2. Coordination: The Contractor shall arrange, schedule and coordinate work by utility companies and agencies.
3. Payment: Costs, if any, imposed by utility companies and agencies shall be included in the Contract Sum.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 1. Verify that construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
 2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- D. Remove existing work as indicated and as required to accomplish new work.
 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 2. Remove items indicated on drawings.
 3. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. See Section 01 10 00 for other limitations on outages and required notifications.
 4. Verify that abandoned services serve only abandoned facilities before removal.
 5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

SECTION 02 84 00
POLYCHLORINATE BIPHENYL (PCB) REMEDIATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish labor, materials, services, and equipment necessary for complete removal and disposal of the following demolition debris in accordance with federal, state, and local regulations:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.
 - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Perform PCB removal and disposal work in accordance with 40 CFR 761 and the requirements specified herein.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Other selective demolition procedures.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Disposal of normal demolition debris.

1.03 DEFINITIONS

- A. Toxic Substances: PCBs, mercury, and other substances regulated under the U.S. Federal Toxic Substances Control Act (TSCA); substances covered by this specification are identified under SECTION INCLUDES.
- B. Leak: Leak or leaking means any instance of a toxic substance present on any portion of the external surface of an item of equipment or container.
- C. PCBs: PCBs as used in this specification shall mean the same as PCBs, PCB Article, PCB Article Container, PCB Container, PCB Equipment, PCB Item, PCB Transformer, PCB-Contaminated Electrical Equipment, as defined in 40 CFR 761, Section 3, Definitions.
- D. Spill: Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of toxic substances running off or about to run off the external surface of an item of equipment or other source, as well as the contamination resulting from those releases.
- E. Universal Waste: Any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR 273:
 - 1. Batteries as described in Sec. 273.2 of that chapter.
 - 2. Thermostats as described in Sec. 273.4 of that chapter.
 - 3. Lamps as described in Sec. 273.5 of that chapter.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1910.132-138 - Personal Protective Equipment.
- B. 29 CFR 1910.145 - Accident Prevention Signs and Tags.
- C. 29 CFR 1910.1000 - Air Contaminants.
- D. 40 CFR 273 - Standards For Universal Waste Management.
- E. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions.
- F. 49 CFR 178 - Specifications for Packaging.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures, except that all submittals are to be made to District, not to Architect.
- B. Qualifications of Certified Industrial Hygienist: Submit name, address, and telephone number and documentation of certification, including certification number and date of certification or recertification.
- C. Toxic Substances Removal Work Plan.
- D. Disposal Plan.
- E. Worker Training Certification: Submit certificates, prior to the start of work but after the main abatement submittals, signed and dated by the Certified Industrial Hygienist and by each employee stating that the employee has received training; organize by individual worker not by type of certificates.
- F. Notification of start of removal work.
- G. Spill notification and documentation:
 - 1. Certification of Decontamination for PCB Spill.
 - 2. Post-cleanup sampling data, if required.
- H. Transporter and disposal documentation.

1.06 QUALITY ASSURANCE

- A. Notification: Notify District 20 days prior to the start of toxic substance removal work.
- B. Reference Documents: At all times maintain one copy each of 29 CFR 1910.1000, 40 CFR 761, and Contractor work practices for removal, storage and disposal of toxic substances, at field office and one copy each in view at project site.
- C. Certified Industrial Hygienist (CIH): Obtain services of an industrial hygienist certified by American Board of Industrial Hygiene to review and approve Toxic Substances Removal Plan, including determination of the need for personnel protective equipment (PPE) in performing toxic substance removal work, and to certify training.
- D. Training: Instruct employees on dangers of exposure to toxic substances present and on respirator use, decontamination, and applicable regulations.
- E. Surveillance Personnel: Surveillance personnel may enter Control Areas for brief periods of time provided they wear disposable polyethylene gloves and disposal polyethylene foot

covers, as a minimum. Additional protective equipment may be required if respiratory hazard is involved or if skin contact with PCB is involved.

- F. Toxic Substances Removal Work Plan: Submit a detailed job-specific plan of the work procedures to be used in the removal and containment of toxic substance-containing materials, not to be combined with other hazardous abatement plans.
 - 1. Select removal procedures to minimize contamination of work areas with toxic substances or contaminated debris or waste.
 - 2. Include a sketch showing the location, size, and details of Control Areas.
 - 3. Include location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system.
 - 4. Include eating, drinking, smoking and restroom procedures, interface of trades, sequencing of related work, Disposal Plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that toxic substances are not spread or carried outside of the control area unless properly containerized or controlled.
 - 5. Include provisions to ensure that airborne PCB concentrations of 3.10 E-08 pound per cubic foot of air are not exceeded outside of Control Area; include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring.
 - 6. Obtain approval of plan prior to the start of removal work.
- G. Disposal Plan: Within 45 calendar days after award of contract submit a Disposal Plan that complies with applicable requirements of federal, state, and local waste regulations.
 - 1. Do not proceed without District's approval of plan.
 - 2. Include in Plan:
 - a. Identification of wastes associated with the work.
 - b. Estimated quantities of wastes to be generated and disposed of.
 - c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes.
 - d. Disposal facility location and 24-hour point of contact; furnish two copies of facility's EPA waste permit applications and EPA Identification numbers.
 - e. Names and qualifications (experience and training) of personnel who will be working on-site with toxic substances.
 - f. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
 - g. Spill prevention, containment, and cleanup contingency measures to be implemented.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29 CFR 1910.132-138; including, but not limited to, the following:
 - 1. Disposable coveralls.

2. Gloves (Disposable rubber gloves may be worn under these).
 3. Disposable foot covers (polyethylene).
 4. Chemical safety goggles.
 5. Half mask cartridge respirator.
- B. Special Clothing for District's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.
- C. PCB Spill Kit: Include the following items, in at least the quantity indicated:
1. Disposable Gloves (Polyethylene): 6 Pairs.
 2. Gloves With A High Degree Of Impermeability To PCB: 6 Pairs
 3. Disposable Coveralls With Permeation Resistance To PCB: 4 Each.
 4. Chemical Safety Goggles: 2 Each.
 5. Disposable Foot Covers (Polyethylene): 6 Pairs.
 6. PCB Caution Sign: "PCB Spill--Authorized Personnel Only": 2 Each.
 7. Banner Guard Or Equivalent Banner Material: 100 feet.
 8. Absorbent Material.
 9. Blue Polyethylene Waste Bags: 5 Bags.
 10. Cloth Backed Tape: 5 Each.
 11. Area Access Logs, Blank: 1 Roll.
 12. Brattice Cloth 6 by 6 feet: 10 Each.
 13. Rags: 1 Piece.
 14. Ball Point Pens: 20 Each.
 15. Herculite, 4 by 4 feet: 2 Each.
 16. Herculite, 8 by 8 feet: 1 Each.
 17. Blank Metal Signs And Grease Pencils.
 18. Waste Containers: 55 gallon: 2 Each.
 19. Drum (May Be Used As Container For Kit): 1 Each.
- D. PCB Caution Labels: Comply with 40 CFR 761, Subpart C.
1. Affix labels to PCB waste containers and PCB-contaminated items not stored in containers.
 2. Provide label with sufficient print size to be clearly legible, with bold print on contrasting background, displaying the following: "CAUTION: Contains PCBs (Polychlorinated Biphenyls)."
- E. Caution Signs: Comply with 29 CFR 1910.145.
1. Provide signs at approaches to Control Areas.
 2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.
- F. Storage Containers for PCBs: Comply with 49 CFR 178.

1. Liquid PCBs: Department of Transportation (DOT) Specification 17E containers.
 2. Non-Liquid PCB Mixtures, Articles, and Equipment: DOT Specification 5, 5B, or 17C containers with removable heads.
- G. Storage Containers for Mercury-Containing Lamps: Appropriate DOT containers (original transport boxes or equivalent).

PART 3 EXECUTION

3.01 PREPARATION

- A. Control Area: Isolate Control Area by physical boundaries to prevent unauthorized entry of personnel; do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored.

3.02 WORK PROCEDURE - PCBS

- A. Permissible Exposure Limits (PEL): PEL for PCBs is 3.1 E-08 pounds per cubic foot on an 8-hour time weighted average basis.
- B. Work Operations: Ensure that work operations and processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable requirements of this section, including but not limited to:
1. Obtaining advance approval of PCB storage sites.
 2. Notifying District prior to commencing the operation.
 3. Reporting leaks and spills to District.
 4. Cleaning up spills.
 5. Maintaining access log of employees working in Control Area and providing copy to District upon completion of the operation.
 6. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to District.
 7. Maintaining the specified spill kit.
 8. Maintaining inspection, inventory and spill records.
- C. Perform PCB removal as described in PCB Removal Work Plan; handle PCBs so that no skin contact occurs.
- D. Personnel Protection: Require workers to wear and use PPE, as recommended by the Industrial Hygienist, upon entering PCB control area. If PPE is not required by the CIH, so state in PCB Removal Work Plan.
- E. Footwear: Keep work footwear inside work area until completion of removal operations.
- F. Hazards:
1. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced.
 2. Do not heat or handle PCBs to temperatures of 135 degrees F or higher without District's concurrence.
- G. Package, mark, transport, and dispose of PCBs as required by regulations.

- H. Control Area: Allow only personnel certified as having received specified training into the control area.
- I. No Smoking: Smoking is not permitted within 50 feet of control area; provide "No Smoking" signs as directed by District.
- J. Confined Spaces: Wherever feasible, do not carry out PCB handling operations in confined spaces having limited means of egress and inadequate cross ventilation.
- K. Exhaust Ventilation: If used, discharge exhaust ventilation for PCB operations to outside and away from personnel.
- L. Solvent Cleaning: Clean contaminated tools, containers, etc., after use by rinsing three times with appropriate solvent or by wiping down three times with solvent wetted rag; suggested solvents are Stoddard solvent and hexane.
- M. Drip Pans: Place drip pans under portable PCB transformers and rectifiers in use or stored for use; provide pans with containment volume of at least one and one-half times internal volume of PCBs that would drain into pan.
- N. Evacuation Procedures: Establish written procedures for evacuation of injured workers; do not delay aid for a seriously injured worker for reasons of decontamination.

3.03 PCB-CONTAINING EQUIPMENT EXCEPT BALLASTS

- A. Draining of Liquid PCB: Drain equipment items of free flowing liquid prior to transportation.
 - 1. Place the drained liquids in specified containers, filled with not more than 50 gallons of oil.
 - 2. Do not mix different concentrations in the same container.
 - 3. Containers must have a 2 inch ullage space from the top of the container.
 - 4. After draining add absorbent material to absorb oil residue remaining.
- B. If equipment cannot be drained, place it in storage container of the type specified.
- C. Markings: Apply specified PCB Caution Labels to containers and drained PCB-contaminated electrical equipment.
 - 1. Apply date drained to transformer using stencil or grease pencil.
 - 2. Containers: Stencil on the following:
 - a. PCB content in parts per million (ppm).
 - b. Date container filled.
 - c. Serial number of transformer liquid came from.
 - d. National Stock Number:
 - 1) "9999-00-OIL" for less than 50 ppm.
 - 2) "9999-00-CONPCB" for 50 to 499 ppm.
 - 3) "9999-00-PCBOIL" for greater than 500 ppm.

3.04 BALLASTS

- A. As ballasts are removed from lighting fixtures, inspect label on ballast.
 - 1. Ballasts Without "No PCB" Label: Assume to contain PCBs; containerize and dispose of as specified.

2. Ballasts With "No PCB" Label: If there are less than 1600 total to be removed from project, dispose of them as normal demolition debris.
- B. More Than 1600 "No PCB" Labeled Ballasts: Determine whether the "No PCB" labeled ballasts contain diethylhexyl phthalate (DEHP) either by testing or by checking with ballast manufacturer indicated on the label.
 1. Submit testing results and/or written confirmation from manufacturer to District.
 2. If the ballasts do not contain DEHP, dispose of them as normal demolition debris.
 3. If they do contain DEHP, dispose of them as as specified for PCBs.
 4. As basis of contract assume ballasts with "No PCB" labels do not contain DEHP.
 5. If 1600 or more DEHP ballasts are disposed of in a 24 hour period, notify the National Response Team at 800-424-8802.

3.05 MERCURY-CONTAINING LIGHTING LAMPS

- A. Lighting Lamps: Remove lighting tubes/lamps from lighting fixtures and carefully place, unbroken, into containers.
 1. In the event a lighting tube/lamp breaks, sweep up pieces and contents and place waste in double plastic taped bags and dispose of as Universal Waste as specified in 40 CFR 273.
- B. Deliver unbroken, boxed, lamps to local appropriate disposal facility.

3.06 PCB SPILL CLEANUP REQUIREMENTS

- A. Immediately report to District all PCB spills on the ground or in the water, PCB spills in drip pans, and PCB leaks.
- B. Control Area: Rope off area around edges of PCB leaks and spills and post "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to drip pan or other container.
- C. Cleanup: Comply with 40 CFR 761, Subpart G.
 1. Initiate cleanup of spills as soon as possible, but no later than 48 hours of its discovery.
 2. Require personnel to wear specified PPE, unless determined not required by CIH.
 3. If misting, elevated temperatures, or open flames are present, or if spill is situated in a confined space, notify District.
 4. Mop up liquid with rags or other conventional absorbent.
 5. Treat spent absorbent as solid PCB waste.
- D. Records and Certification: Document cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup; provide certification of decontamination.
- E. Sampling: Perform post cleanup sampling as required by 40 CFR 761, Section 130, Sampling Requirements.
- F. Do not remove boundaries of PCB control area until site is determined satisfactorily clean by District.

3.07 TEMPORARY STORAGE PRIOR TO DISPOSAL

- A. Storage Site: Obtain District's approval in advance of areas, spaces, rooms, and buildings used to store toxic substances prior to disposal off-site; storage sites must comply with the following criteria without exception:
 - 1. Adequate roof and walls to prevent rainwater from reaching stored toxic substances.
 - 2. Adequate floor that has continuous curbing with minimum 6 inch high curb, with containment volume equal to at least two times internal volume of largest toxic substance article or container stored therein or 25 percent of total internal volume of all toxic substance containing equipment or containers stored therein, whichever is greater.
 - 3. No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area.
 - 4. Floors and curbing constructed of continuous smooth and impervious materials, such as Portland cement, concrete, or steel, to prevent or minimize penetrations of toxic substances.
 - 5. Not located at a site that is below the 100-year flood water elevation.
 - 6. Posted with specified Caution Sign.
- B. Store PCBs, PCB articles, and PCB-contaminated items in specified containers.
 - 1. Label waste containers with the following:
 - a. "Solid (or Liquid) Waste Polychlorinated Biphenyls."
 - b. Specified PCB Caution Label.
 - c. Date item was placed in storage and name of generator.
 - 2. Label PCB articles and PCB-contaminated items with the following:
 - a. Specified PCB Caution Label.
 - b. Date item was placed in storage and name of generator.
- C. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.08 CLEANING

- A. Clean up and containerize wastes daily.
- B. Maintain surfaces of Control Areas free of accumulations of toxic substances. Restrict spread of dust and debris; keep waste from being distributed over work area.
- C. Do not remove Control Area boundaries or warning signs prior to District's approval.
- D. Reclean areas showing residual toxic substances.

3.09 DISPOSAL BY CONTRACTOR

- A. Comply with disposal requirements and procedures specified in 40 CFR 761 and State of California requirements; deliver toxic substance waste to a disposal facility having required permits.
 - 1. Do not accept toxic substance waste unless it is accompanied by a manifest signed by District.

2. Before transporting toxic substance waste, sign and date manifest acknowledging acceptance of the waste from District.
 3. Return a signed copy to District before leaving project site.
 4. Ensure that manifest accompanies waste at all times.
 5. Submit transporter certification of notification to EPA of their toxic substance waste activities.
- B. Payment will not be made until Certificate of Disposal has been furnished to District.
- C. Certificate of Disposal: Submit to District within 30 days of date that disposal of waste identified on manifest was completed; include on the certificate:
1. The identity of disposal facility, by name, address, and EPA identification number.
 2. The identity of waste affected by Certificate of Disposal including reference to manifest number for the shipment.
 3. Statement certifying the fact of disposal of the identified waste, including date(s) of disposal, and identifying disposal process used.
 4. Certification as defined in 40 CFR 761, Section 3.

END OF SECTION

SECTION 03 01 00
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of existing concrete surfaces.
- B. Resurfacing of concrete surfaces having spalled areas and other damage.
- C. Repair of deteriorated concrete.
- D. Scope of Work: As indicated on the drawings and as required as work progresses for hidden conditions after consultation with the Architect.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCE STANDARDS

- A. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
- B. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- C. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- D. ASTM C150/C150M - Standard Specification for Portland Cement.
- E. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
- F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- G. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- H. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
- I. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- J. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling: Perform blast cleaning only between the hours of 7 am to 10 pm.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

- C. Manufacturer's Qualification Statement.
- D. Cleaner's Qualification Statement.
- E. Installer's Qualification Statement.
- F. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Cleaner Qualifications: Company specializing in, and with minimum of 3 years of experience in, the type of cleaning specified.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

1.07 MOCK-UP(S)

- A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.
- B. Crack Injection: Prepare one sample of each type of injection.
- C. Horizontal Surface Repair: Total of 10 foot square area, demonstrating each type of repair.
- D. Where color or texture matching is required, first prepare a small size sample on cementitious board.
- E. Locate mock-up(s) where directed.
- F. Re-work mock-up(s) until satisfactory to Architect.
- G. Satisfactory mock-up(s) may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

- A. Degreaser:
 - 1. Manufacturers:
 - a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
 - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com/#sle.
 - c. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.
 - d. W.R. Meadows, Inc: www.wrmeadows.com.
- B. Detergent: Non-ionic detergent.

2.02 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

A. Manufacturers:

1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
4. Euclid Chemical Company: www.euclidchemical.com/#sle.
5. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
6. The QUIKRETE Companies: www.quikrete.com/#sle.
7. SpecChem, LLC: www.specchemllc.com/#sle.
8. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bonding Slurry: Water-based latex admixture complying with ASTM C1059/C1059M, combined with Portland cement and sand in accordance with admixture manufacturer's instructions.

1. Admixture Manufacturers:

- a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
- b. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
- c. The QUIKRETE Companies; QUIKRETE® Concrete Bonding Adhesive: www.quikrete.com/#sle.
- d. SpecChem, LLC; Strong Bond - Acrylic Bonder: www.specchemllc.com/#sle.
- e. W. R. Meadows, Inc; Acry-lok: www.wrmeadows.com/#sle.

C. Cementitious Resurfacing Mortar: One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.

1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
2. Recommended Thickness: Feather edge to 1/8 inch.
3. Color: Gray.
4. Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - c. Euclid Chemical Company; THIN TOP SUPREME: www.euclidchemical.com/#sle.
 - d. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duracrete: www.lmcc.com/#sle.
 - e. The QUIKRETE Companies; QUIKRETE® Concrete Resurfacer: www.quikrete.com/#sle.
 - f. SpecChem, LLC; Duo Patch: www.specchemllc.com/#sle.
 - g. SpecChem, LLC; Final Finish: www.specchemllc.com/#sle.
 - h. W. R. Meadows, Inc; Parge-All AF: www.wrmeadows.com/#sle.
 - i. W. R. Meadows, Inc; Meadow-Patch T2: www.wrmeadows.com/#sle.

- D. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
 1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
 2. Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. Five Star Products, Inc; Five Star Structural Concrete V/O: www.fivestarproducts.com/#sle.
 - c. The QUIKRETE Companies; QUIKRETE® FastSet Repair Mortar: www.quikrete.com/#sle.
 - d. SpecChem, LLC; RepCon V/O: www.specchemllc.com/#sle.
 - e. SpecChem, LLC; Duo Patch: www.specchemllc.com/#sle.
 - f. W. R. Meadows, Inc; Meadow-Crete GPS: www.wrmeadows.com/#sle.
- E. Cementitious Repair Mortar, Form and Pour/Pump Grade: Flowable, one- or two-component, factory-mixed, polymer-modified cementitious mortar; in-place material resistant to freeze/thaw conditions.
 1. Mixed with water in proportions as recommended by manufacturer.
 2. Integral corrosion inhibitor.
 3. Manufacturers:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Five Star Products, Inc; Five Star Structural Concrete: www.fivestarproducts.com/#sle.
 - c. SpecChem, LLC; Duo Patch; www.specchemllc.com/#sle.
 - d. SpecChem, LLC; RepCon H-350; www.specchemllc.com/#sle.
 - e. W. R. Meadows, Inc; Meadow-Crete FNP: www.wrmeadows.com/#sle.
- F. Cementitious Pavement Repair Mortar: Fast hardening, flowable; composed of cement, sand, and additives; capable of setting in cold weather conditions without the aid of chloride- or gypsum-based accelerators; in-place material resistant to freeze/thaw conditions.
 1. Dry Material: Complies with ASTM C928/C928M.
 2. Manufacturers:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Prospec; Premium Patch 100: www.prospec.com.
 - c. Prospec; Premium Patch 200: www.prospec.com.
 - d. SpecChem, LLC; RepCon 928: www.specchemllc.com/#sle.
 - e. SpecChem, LLC; RepCon 928 FS: www.specchemllc.com/#sle.
 - f. W. R. Meadows, Inc; Futura-15: www.wrmeadows.com/#sle.
 - g. W. R. Meadows, Inc; Futura-45 or Futura-45 Extended: www.wrmeadows.com/#sle.
- G. Cementitious Hydraulic Waterstop: Very fast setting, low slump, hand formable, and capable of stopping active water leaks; in-place material resistant to freeze/thaw conditions.

- H. Exterior Self-Leveling Concrete Topping: Portland cement-based; suitable as wear surface topping in exterior and wet locations as well as underlayment for applied materials.
 - 1. Compressive Strength: 4300 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C109/C109M, air cured.
 - 2. Flexural Strength: 1000 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C348.
 - 3. Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX K301: www.ardexamericas.com/#sle.

2.03 EPOXY PATCHING AND REPAIR MATERIALS

- A. Manufacturers:
 - 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - 2. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - 3. Euclid Chemical Company: www.euclidchemical.com/#sle.
 - 4. Hi-Tech Systems: hitechpolyurea.com
 - 5. SpecChem, LLC: www.specchemllc.com/#sle.
 - 6. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
- B. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.
 - 1. Manufacturers:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company; DURALFLEX FASTPATCH: www.euclidchemical.com/#sle.
 - c. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000, Rezi-Weld LV, or Rezi-Weld LV State: www.wrmeadows.com/#sle.
- C. Epoxy Injection Adhesive:
 - 1. Manufacturers:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
 - c. SpecChem, LLC; SpecPoxy 1000; www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Rezi-Weld LV, Rezi-Weld LV State, Rezi-Weld (IP), or Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.
- D. Epoxy Bonding Adhesive: Non-sag, two-component, 100 percent solids; recommended by manufacturer for purpose and conditions under which used.
 - 1. Non-Load-Bearing Applications: ASTM C881/C881M Type I, II, III, IV, or V, whichever is appropriate to application.
 - 2. Load-Bearing Applications: ASTM C881/C881M Type IV or V, whichever is appropriate to application.

3. Other Applications: ASTM C881/C881M Type as appropriate to application.
4. Manufacturers:
 - a. SpecChem, LLC; SpecPoxy 2000: www.specchemllc.com/#sle.
 - b. SpecChem, LLC; SpecPoxy 3000: www.specchemllc.com/#sle.
 - c. SpecChem, LLC; SpecPoxy 3000 FS: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.
 - e. W. R. Meadows, Inc; Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.
 - f. W. R. Meadows, Inc; Rezi-Weld 1000: www.wrmeadows.com/#sle.

2.04 URETHANE PATCHING AND REPAIR MATERIALS

- A. Polyurethane Repair Gel: Rapid setting, two-component; use with or without aggregate to repair cracks and spalls in concrete surfaces.
 1. Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX ArdiFix: www.ardexamericas.com/#sle.
 - b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - c. Euclid Chemical Company; EUCO QWIKstitch: www.euclidchemical.com/#sle.
 - d. Hi-Tech Systems; HT Spall-TX3: hitechpolyurea.com

2.05 ACCESSORIES

- A. Anchoring Adhesive: Self-leveling or non-sag as applicable.
 1. Self-Leveling Polyester-Based Products:
 - a. W. R. Meadows, Inc; Poly-Grip: www.wrmeadows.com/#sle.
 2. Self-Leveling Epoxy Products:
 - a. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
 - b. SpecChem, LLC; SpecPoxy 2000; www.specchemllc.com/#sle.
 - c. W. R. Meadows, Inc; Rezi-Weld 1000, Rezi-Weld (IP), or Rezi-Weld 3/2: www.wrmeadows.com/#sle.
 3. Non-Sag Epoxy Products:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company; DURAL FAST SET GEL: www.euclidchemical.com/#sle.
 - c. SpecChem, LLC; SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Rezi-Weld Gel Paste or Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.
- B. Portland Cement: ASTM C150/C150M, Type I, grey.
- C. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.
- D. Water: Clean and potable.
- E. Reinforcing Steel: ASTM A615/A615M Grade 60 (60,000 psi) billet-steel deformed bars, unfinished.
- F. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 60 (420), Type A.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, CSP 3.

3.03 CLEANING EXISTING CONCRETE

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
 - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
 - 2. Clean out cracks and voids using same methods.
- C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
 - 1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
 - 2. Increasing the water washing pressure to maximum of 400 psi.
 - 3. Adding detergent to washing water; with final water rinse to remove residual detergent.
 - 4. Steam-generated low-pressure hot-water washing.
- D. Do not use any of the following cleaning methods, unless otherwise indicated:
 - 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
 - 2. Soap or detergent that is not non-ionic.
 - 3. Alkaline cleaning agents.
 - 4. Acidic cleaning agents.
 - 5. Abrasive blasting.

3.04 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

- A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.
- B. Apply coating of bonding agent to entire concrete surface to be repaired.
- C. Fill voids with cementitious mortar flush with surface.
- D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface, terminating at a vertical change in plane on all sides.
- E. Trowel finish to match adjacent concrete surfaces.

3.05 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 40 00, will perform field inspection and testing.
 - 1. Test concrete for calcium chloride content during the execution of the Work.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundations and anchor bolts.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads and thrust blocks.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- B. Section 32 13 13 - Site Concrete: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- C. ACI 301 - Specifications for Structural Concrete.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- F. ACI 305R - Guide to Hot Weather Concreting.
- G. ACI 306R - Guide to Cold Weather Concreting.
- H. ACI 308R - Guide to External Curing of Concrete.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- J. ACI 347R - Guide to Formwork for Concrete.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- O. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- P. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

- Q. ASTM C150/C150M - Standard Specification for Portland Cement.
- R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- S. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- U. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
- V. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
- W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- X. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- Y. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- Z. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- AA. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- AB. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- AC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- AD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- AE. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- AF. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. Including printed statement of VOC content and material safety data sheets.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 19 and 26.
- D. Shop Drawings: Submit proposed layout of construction and control joints for approval.
- E. Samples: Submit samples of underslab vapor retarder to be used.

- F. Test Reports: Submit report for each test or series of tests specified.
- G. Mix Design: Submit mix designs prepared, stamped and signed by a Civil Engineer licensed in the State of California.
- H. Quality Control Submittals:
 - 1. Field tests: Submit reports of all slump, strength and air content tests as required by authorities having jurisdiction and as indicated on the Drawings and specified herein.
 - 2. Delivery tickets: Have available copies of delivery tickets complying with ASTM C94/C94M for each load of concrete delivered to site. Include on the tickets the additional information specified in the ASTM document.
- I. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- J. Project Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view upon completion of concrete work.
- K. Warranty: Submit manufacturer warranty and ensure forms have been completed in District's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather .
- C. When air temperature in the shade and away from artificial heat falls below 40 degrees F, or when concrete without special protection is likely to be subject to freezing temperatures before expiration of specified curing period, follow recommendations of ACI 306R when concreting during cold weather.
- D. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.
- E. Regulatory Requirements:
 - 1. Conform to California Building Code (CBC) Chapter 19A requirement, as amended and adopted by authorities having jurisdiction.
 - 2. Chemical products field-applied to concrete shall comply with applicable air quality requirements of authorities having jurisdiction.
 - a. Comply with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions, CALGreen Section 5.504.4 Finish material pollutant control; 5.504.4.1 Adhesives, sealants and caulks; 5.504.4.3 Paints and coatings.
- F. Testing Agency Services: District will engage an independent testing and inspection agency to conduct tests and perform other services specified for quality control during construction, as required by Sections 01 40 00 - Quality Requirements and Section 01 45 33 - Code-Required Special Inspections.
- G. Coordination: Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories. Coordinate concrete requirements with Work specified for underground utilities and mechanical and electrical equipment pads and bases.

1.06 MOCK-UP

- A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish as result of formwork.
 - 1. Panel Size: Sufficient to illustrate full range of treatment.
 - 2. Number of Panels: Two.
 - 3. Locate as indicated on drawings.
- B. If requested by Architect, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.
- C. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.
- D. Mock-up may remain as part of the Work.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of the concrete.
 - 1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
 - 2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.
- C. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.
 - 1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

1.08 DELIVERY AND HANDLING

- A. Protection During Concrete Placement: Provide protective coverings and runways, and use appropriate equipment and means of access to Work areas to avoid soiling or damage to existing conditions.
- B. Runoff: Prevent run off of water contaminated by construction agents and chemicals from soiling existing surfaces and from contaminating existing and future landscape areas.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that provides a smooth, stain-free final appearance.
2. Form Coating: Release agent that does not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 1. Type: Deformed billet-steel bars.
 2. Finish: Unfinished, unless otherwise indicated.
- B. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Provide galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering or wet surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire aggregates for entire project from same source.
 2. Fine and coarse aggregates, CBC Title 24, Part 2, and as follows.
 - a. Structural Concrete: Maximum size not larger than 1/5 of narrowest dimension between forms, 1/3 depth of slab nor 3/4 of minimum clear spacing between individual reinforcing bars. Maximum aggregate size shall be 1 inch.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

- A. Chemical Admixture:
 1. Use no admixtures not included in mix design. Products of the following manufacturers are specified and will be acceptable provided they comply with referenced standards all other requirements of the Contract Documents:
 - a. Manufacturers:
 - 1) BASF Building Systems: www.buildingsystems.basf.com.
 - 2) Dayton Superior Corporation: www.daytonsuperior.com.
 - 3) Euclid Chemical Co.: www.euclidchemical.com.
 - 4) L&M Construction Chemicals, Inc.: www.lmcc.com.
 - 5) Larsen Products Corp.: www.larsenproducts.com.
 - 6) MeadowBurke Co.: meadowburke.com.
 - 7) W.R. Meadows, Inc.: www.wrmeadows.com.
 - 8) Sika Corporation; www.us.sika.com.
 - 9) Simpson Strong-Tie: www.strongtie.com

- 10) Specialty Products Group: www.SPGoGreen.com.
 - 11) US Spec Division of US Mix Products Co.: www.usspec.com.
 - 12) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Do not use chemicals that result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- 1. Manufacturers:
 - a. Euclid Chemical Company; ACCELGUARD 80: www.euclidchemical.com/#sle.
 - b. Accelguard 80 by Euclid Chemical Co.
 - c. Pozzutec 20 by Master Builders Technology, Inc.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- 1. Manufacturers:
 - a. L.M. Scofield Company: www.scofield.com.
 - b. Eucon Retarder 75 by Euclid Chemical Co.
 - c. Pozzolith R by Master Builders Technology, Inc.
 - d. Plastiment by Sika Corporation.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Water Reducing Admixture: ASTM C494/C494M Type A.
- 1. Manufacturers:
 - a. Euclid Chemical Company; EUCON NW: www.euclidchemical.com/#sle.
 - b. Eucon WR-75 by Euclid Chemical Co.
 - c. Pozzolith Normal or Polyheed by Master Builders Technology, Inc.
 - d. Plastocrete 161 by Sika Corporation.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
- 1. Provide admixture in slabs to receive adhesively applied flooring.
 - 2. Installed admixture to meet or exceed Modified ASTM F1869 or ASTM F2170 testing to performance of moisture vapor emission rate (MVER) of 4 lbs/1,000 ft²/24 hours or lower.
 - a. Alternative test methods shall be acceptable to the finish flooring manufacturer and installer.
 - 3. The concrete ready mix supplier must coordinate with the admixture manufacturer before designing and testing any new mix designs, to receive guidance on achieving proper water absorption characteristics.
 - 4. Manufacturers:
 - a. Barrier One, Inc; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com/#sle.

- b. Concure Systems; Concure Systems Admixture: www.concuresystems.com.
- c. Hycrete, Inc: www.hycrete.com/#sle.
- d. ISE Logik Industries, Inc; MVRA 900: www.iselogik.com/#sle.
- e. Specialty Products Group; Vapor Lock 20/20: www.spgogreen.com/#sle.
- f. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Manufacturers:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15, 15 mils thick (0.010 max. permeance), Class A, unreinforced polyolefin: www.fortifiber.com/#sle.
 - b. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
 - c. Raven Industries; VaporBlock VB15, 15 mils thick (0.01 perms), Class A, unreinforced polyolefin: ravenefd.com,
 - d. Reef Industries, Inc.; Vaporguard, 15 mil (E-96 0.000 perms), Class B: www.reefindustries.com
 - e. Stego Industries, LLC; Stego Wrap Vapor Barrier, 15 mils: www.stegoindustries.com.
 - f. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
 - 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 - 3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 - 4. Minimum Compressive Strength at 28 Days: 8,000 pounds per square inch.
 - 5. Flowable Products:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
 - c. Sika Corporation; SikaGrout 328: www.us.sika.com.
 - d. SpecChem, LLC; SC Precision Grout: www.specchemllc.com/#sle.
 - e. US SPEC; MP Grout: www.usspec.com.

- f. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/#sle.
 - g. W. R. Meadows, Inc; 1428 HP: www.wrmeadows.com/#sle.
 - h. Substitutions: See Section 01 60 00 - Product Requirements.
6. Low-Slump, Dry Pack Products:
- a. Dayton Superior Corporation; Dri Pak Precast Grout: www.daytonsuperior.com/#sle.
 - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: www.lmcc.com/#sle.
 - c. Sika Corporation; SikaGrout 212: www.us.sika.com.
 - d. US SPEC; GP Grout: www.usspec.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
- 1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
 - a. Maximum Height Change: Plus 4 percent.
 - b. Minimum Height Change: Plus 1 percent.
 - 2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch.
OR
 - 3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.
 - 4. Manufacturers:
 - a. Euclid Chemical Company; E3-DEEP POUR: www.euclidchemical.com/#sle.
 - b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - c. Euclid Chemical Co.; www.euclidchemical.com.
 - d. Five Star Products, Inc; Five Star DP Epoxy Grout: www.fivestarproducts.com.
 - e. L&M Construction Chemicals, Inc.; www.lmcc.com.
 - f. Sika Corporation; Sika Grout Pak 42: www.us.sika.com.
 - g. SpecChem, LLC; SpecPoxy Grout: www.specchemllc.com.
 - h. US Mix Products Co.; www.usspec.com.
 - i. W.R. Meadows, Inc.; REZI-WELD 3/2: www.wrmeadows.com.
 - j. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

- A. Interior Exposed Control Joints: Sawcut joints after concrete placement and finish. Preformed joint materials are not acceptable.
- B. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
 - 1. Acrylic or Styrene Butadiene:
 - 2. Manufacturers:
 - a. BASF Building Systems; MasterEmaco A 400 or A 600: www.buildingsystems.basf.com.

- b. Dayton Superior Corp.; Acrylic Bonding Agent J40: www.daytonsuperior.com
 - c. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
 - d. L&M Construction Chemicals, Inc.; Everbond: www.lmcc.com.
 - e. MeadowBurke Co.; Arcylic Bond: meadowburke.com.
 - f. Sika Corporation; Sika Latex by Sika Corporation: www.us.sika.com.
 - g. Simpson Strong-Tie; FX-Bondcrete: www.strongtie.com
 - h. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
 - i. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.
 - j. US Spec Division of US Mix Products Co.; Acrylcoat, Dura: www.usspec.com.
 - k. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Epoxy Bonding System:
- 1. Complying with ASTM C881/C881M and of Type required for specific application.
 - 2. Manufacturers:
 - a. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - b. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
 - c. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com/#sle.
 - d. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com/#sle.
 - e. Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com/#sle.
 - f. Dayton Superior Corporation; Slow Set Bonding Agent: www.daytonsuperior.com/#sle.
 - g. Sika Corporation; Sikadur 31 Hi Mod Gel or Sikadur 32 Hi Mod Bonder: www.us.sika.com.
 - h. Simpson Strong-Tie; FX-752 Epoxy Bonding Agent, FX-762 High-Modulus Epoxy Bonding Agent, FX-792LPL Long Pot Life Epoxy Bonding Agent: www.strongtie.com
 - i. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com/#sle.
 - j. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com/#sle.
 - k. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Acetate Bonding Agent: Non-redispersable polyvinyl acetate.
- 1. Interior only except areas exposed to moisture
 - 2. Manufacturers:
 - a. Dayton Superior Corp.; PVA Bonding Agent J41: www.daytonsuperior.com
 - b. Euclid Chemical Co.; Tammsweld: www.euclidchemical.com.
 - c. L&M Construction Chemicals, Inc.; Everweld II: www.lmcc.com.
 - d. Larsen Products Corp; Weldcrete: www.larsenproducts.com/#sle.
 - e. W.R. Meadows, Inc.; Deck-O-Weld: www.wrmeadows.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

1. Material: Closed-cell, non-absorbent, compressible polymer foam in sheet form.
2. Manufacturers:
 - a. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip:
www.wrmeadows.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
 1. Manufacturers:
 - a. Atlas Tech Products Division of Atlas Construction Supply, Inc.;; Atlas Finish-Film:
www.atlastechproducts.com.
 - b. Dayton Superior Corporation; AquaFilm Concentrate J74:
www.daytonsuperior.com/#sle.
 - c. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
 - d. Nox-Crete Inc; Monofilm: www.nox-crete.com/#sle.
 - e. Master Builder Solutions by BASF; MasterKure ER 50:
www.master-builders-solutions.basf.us.
 - f. Nox-Crete Products Group; Monofilm: www.nox-crete.com
 - g. Sika Corp.; SikaFilm: usa.sika.com.
 - h. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
 - i. W. R. Meadows, Inc ; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
 - j. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Liquid, membrane-forming, clear sealer, for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
 1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
 2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
 3. VOC Content: Less than 100 g/L.
 4. Manufacturers:
 - a. Obex; Creteseal CS2000: www.obexco.com.
 - b. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com/#sle.
 - c. Nox-Crete Inc; Cure & Seal 1200E: www.nox-crete.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Moisture-Retaining Sheet: ASTM C171.
 1. Curing paper, regular.
 2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.

- 3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- D. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

- A. Mix Design: Contractor shall coordinate with the Testing Laboratory of Record, under supervision of Civil Engineer licensed in the State of California, to determine mix proportions to fulfill specified requirements for strength, aggregate, size and workability of concrete.
- B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 - 1. Comply with Chapter 19A requirements.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- E. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on Structural Drawings.
 - 2. Proportions: For normal weight concrete, in accordance with ACI 301, and as noted on the Drawings.
 - 3. Water/Cement Ratio for Concrete in Contact with Soil: Not to exceed 0.45, unless otherwise indicated on Structural Drawings.
 - 4. Water-Cement Ratio: Maximum 40 percent by weight.
 - 5. Maximum Slump: As indicated on Structural Drawings.
 - 6. Maximum Aggregate Size: As indicated on Structural Drawings.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Layout construction and control joints according to the drawing details and plans following these guidelines:
 - 1. Finished exposed concrete floors are critical for aesthetics.

2. Layout joints on exposed concrete floors to allow for installation of utilities without sawcutting or concrete placement of different production batches subject to different colors. Staining and integral color concrete is not exempt from this requirement.
 3. Architect to review joint pattern submittal each floor.
 4. No lengthwise joints in corridors; place cross-corridor, if required.
 5. Place joint at 90 degree wall corners.
 6. Place joints at center line of columns.
 7. Equally space all joints.
- C. Verify that concrete cover requirements are met in formwork construction and reinforcement placement.
 - D. Verify that base material (sand, gravel or natural as specified or indicated on Drawings) level, vapor barrier/retarder properly placed and that required clearances to reinforcing steel have been maintained.
 - E. Verify that all embedded products and formed openings and recesses are correctly placed.
 - F. At slabs on grade, verify that vapor retarder/barrier is properly placed and free of damage.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Prepare previously placed concrete by cleaning with hydro-blasting or wet sand blasting to provide suitable surface for bonding. Provide minimum aggregate exposure of 1/4 inch.
- D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 2. Use latex bonding agent only for non-load-bearing applications.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 1. See Section 072616 - Under-Slab Vapor Retarder.
 2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.
 - a. Install total thickness indicated on Drawings. Provide crushed rock, 1/2 inch grading, clean washed, complying with ASTM C33/C33M.
 - b. Comply with CA Green Code Section 4.505.2.1 Capillary Break.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.04 CONCRETE MIXING

- A. Concrete Mixing, General: Comply with ACI 318 as adopted by CBC, Title 24, Part 2, Chapter 19A and ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete. Introduce and mix admixtures in compliance with manufacturer's instructions and recommendations.

3.05 PLACING CONCRETE

- A. Notify District's Inspector and DSA at least 2 working days in advance of placing concrete.
- B. Place concrete in accordance with ACI 304R. General: Comply with ACI 318 as adopted by CBC, Title 24, Part 2, Chapter 19A and as follows:
 - 1. Schedule continuous placement of concrete to prevent the formation of cold joints.
 - 2. Ready mix concrete shall be delivered in accordance with ASTM C94/C94M. Concrete shall be placed within 90 minutes after start of mixing.
 - 3. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
 - a. Submit for review, proposed locations of joints prior to pouring. See Structural Drawings for additional requirements.
 - 4. Deposit concrete as close as possible to its final location, to avoid segregation.
- C. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
 - 1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
 - 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
 - 3. Do not use vibrators to move concrete laterally.
- D. Place concrete for floor slabs in accordance with ACI 302.1R. Schedule continuous placement and consolidation of concrete within planned construction joints.
 - 1. Place concrete in linear pattern, with control joints at slab on grade conditions only, with joints located as indicated on the Drawings.
 - 2. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds or vibrating laser screed as described below.
 - 3. Screeding Procedures: Strike off and level concrete slab surfaces before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

- a. Typical Slabs: Strike off and level surface using highway straight edges, darbies or bull floats.
- 4. Create control and construction joints true to line and profile. Do not radius the joints. Refer to the Drawings for structural requirements of joints.
- 5. Sawcut control joints to one-quarter of slab depth, immediately after slab has achieved initial set and not longer than 8 hours. "Soff-Cut" method is preferred.
- 6. Alternate control and construction joint products and procedures will be considered in accordance with substitution provision specified in Section 01 60 00 - Product Requirements.
- E. Notify Architect not less than 48 hours prior to commencement of placement operations.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- G. Ensure reinforcement, inserts, and waterstops are not disturbed during concrete placement.
- H. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- I. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.06 SLAB JOINTING

- A. Locate joints as indicated on the approved joint layout shop drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install where indicated and required on Structural Drawings, to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
- E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.
- G. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- H. Separate slabs on grade from vertical surfaces with joint filler.
- I. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- J. Install joint devices in accordance with manufacturer's instructions.
- K. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

- L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- M. Place concrete continuously between predetermined expansion, control, and construction joints.
- N. Do not interrupt successive placement; do not permit cold joints to occur.
- O. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 deg F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 lbs./SF/Hr..
 - 1. Use evaporation reducer.
 - 2. Do not add water to approved concrete mixes under any conditions.
 - 3. Provide mixing water at lowest feasible temperature, and provide adequate protection of poured concrete to reduce rate of evaporation.
 - 4. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.
- P. Cold-Weather Placement: Comply with provisions of ACI 306R when air temperature has fallen to or is expected to fall below 40 deg F. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. Uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- Q. Protection: Ensure that reinforcement, embedded products, joint fillers and joint devices are not disturbed during concrete placement.
- R. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
 - 1. Locate construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
 - a. Dowel Joints: As indicated on Drawings.
 - 2. Hydro wash joint to 1/4 inch aggregate exposure, followed by wet process sandblast or second hydrowash.
 - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- S. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, or as indicated.
 - 1. Structural slab contact at foundation walls and grade beams shall be doweled as detailed.

- T. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.

3.07 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, remove deleterious material. Broom and vacuum clean.
- B. Place required dividers, edge strips, and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.
- E. Place concrete floor toppings to required lines and levels.
 - 1. Place topping in checkerboard panels not to exceed 20 feet in either direction.
- F. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.08 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.
- B. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet, non-cumulative.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3. Under Carpeting: 1/4 inch in 10 feet.
 - 4. For the following applications, depressions in slab floors between high spots shall be a maximum 1/8 inch in 10 ft., using a metal straight edge placed at any location on slab, and measured within 72 hours of pour.
 - a. Slabs receiving thin-set ceramic tile as specified in Section 09 30 00 - Tiling.
 - b. Additional floor finishes may require similar tolerances that are not noted here. Refer to individual sections for their requirements.
 - 5. Curbs:
 - a. Top of Curb: 1/4 inch in 10 ft, non-cumulative.
 - b. Side of Curb: 1/8 inch in 10 ft, non-cumulative, vertical and horizontal.
- C. Correct the slab surface if tolerances are less than specified.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.09 CONCRETE FINISHING

- A. Repair surface defects, immediately after removing formwork.
 - 1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting without damaging reinforcement. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
 - 2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white

and normal portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.

- B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.10 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water-fog spray or saturated burlap.
 - a. Spraying: Spray water over floor slab areas and maintain wet.
 - b. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
 - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of Work specified in other Sections, after such Work is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work. Use non-shrink grout where required or indicated.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by 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 diagrams or templates of manufacturer furnishing machines and equipment.

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Field Certifications: For all concrete, provide signed copy of batch plant's certificate stating quantity of each material, amount of water, admixtures, departure time and date accompanying each load of materials or concrete.
- E. Field Tests of Concrete: Perform tests in accordance with applicable California Building Code requirements, ACI 301 and requirements of authorities having jurisdiction.
- F. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- G. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 2,000 sq ft - 50 cu yd or less of slab and structural concrete of each class of concrete placed (CBC requirement).
 - 1. Test one cylinder at 7 days and two at 28 days after placement.
 - 2. Maintain fourth cylinder to be tested at 56 days only if 28-day test fails to meet strength requirement.
 - 3. Take one additional test cylinder during cold weather concreting and cure it at job site under same conditions as concrete it represents. Test cold weather cylinder at 28 days.
- H. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- I. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- J. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.13 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
 - 1. Obtain repair details from Architect (Structural Engineer) and approved by DSA before proceeding.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.14 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.
- B. Protect concrete from marring and damage due to weather and construction activities.
 - 1. Protective measures shall include providing temporary coverings, and be in accordance with Section 01 50 00 - Temporary Facilities and Controls, and shall prohibit all non-essential construction activities, including cleaning and maintenance of construction equipment.
 - 2. In particular, protect concrete floor slabs from oil, paint and other products that might penetrate and degrade concrete surface.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface treatments for concrete floors and slabs.
- B. Liquid densifiers and hardeners.
- C. Concrete stains and dyes. CONC-1, CONC-2, CONC-3, CONC-4
- D. Clear coatings.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.
- B. Pre-Concrete Placement Meeting:
 - 1. Prior to the start of concrete placement Contractor shall conduct a meeting to review the required methods and procedures to achieve the required finish. Contractor shall send a meeting agenda to all attendees 20 days prior to the scheduled date of the meeting
 - 2. The Contractor shall require responsible representatives of every party concerned with the concreting work to attend the meeting, including but not limited to the following: Contractor's superintendent, ready-mix company, testing lab, topping and coating applicator, and Construction Manager.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.
- D. Certification: Submit manufacturer's certificate that all materials supplied conform to applicable Federal regulations and to applicable State and Local air pollution emission ordinances and regulations.

1.05 MOCK-UP

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 6 feet square.
 - 1. Demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
- C. Locate where directed.

- D. Acceptable mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

- A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- B. Do not finish floors until interior heating system is operational.
- C. Maintain ambient temperature of 50 degrees F minimum.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.
- C. Finish Warranty: Provide five-year manufacturer warranty against excessive degradation of finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. All products used shall meet VOC requirements listed in Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Requirements for Physically Disabled: Provide flooring meeting slip-resistant requirements of California Code of Regulations (CCR), Title 24, Part 2, Chapter 11B and 2010 ADA Standards, latest amendment.
 - 1. Flooring demonstrating a coefficient of friction of at least wet SCOF 0.6 per ASTM C1028 will be accepted as meeting the intent of slip resistance; CBC 11B-302 Floor or Ground Surfaces, 11B-403 Walking Surfaces, and ADA Standards.
 - a. Also acceptable: A dynamic coefficient of friction of at least 0.42 per DCOF AcuTest ANSI A137.1 Section 9.6 or ASTM F609.
 - 2. Flooring surface shall be stable, firm, and slip resistant. CBC Section 11B-302.1 General.
 - 3. Flooring surface demonstrating a dynamic coefficient of friction of at least 0.42 wet per DCOF AcuTest ANSI A137.1 Section 9.6 and ANSI/NFSI B101.3 (using a BOT-3000 testing unit) will be accepted as meeting the intent of slip resistance; CBC 11B-302 Floor or Ground Surfaces and ADA Standards.
 - a. Ramp surface: Provide DCOF value of 0.46 wet.

2.02 CONCRETE FLOOR FINISH APPLICATIONS

- A. Unless otherwise indicated, all concrete floors are to be finished using high gloss sealer.
- B. Liquid Densifier and Hardener:
 - 1. Use at following locations: CONC-"X" - concrete floors on grade.
- C. Medium Gloss Clear Sealer:

1. Use at following locations: CONC-"X" - Concrete floors with sealer.
- D. Slip Resistant Coating: Finely-ground aggregates added to coatings.
 1. Use at following locations: Utility rooms.

2.03 DENSIFIERS AND HARDENERS

- A. Pre-Densifier Concrete Cleaner: Cleaner to remove dirt, oil, grease, and other stains from existing slab surface.
 1. Basis of Design Product: Consolideck Cleaner/Degreaser as manufactured by PROSOCO, Inc., www.prosoco.com, or approved equal.
 2. Basis of Design Product: Consolideck Cure & Seal Remover as manufactured by PROSOCO, Inc., www.prosoco.com, or approved equal.
- B. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
 1. Basis of Design Product: Consolideck LS/CS as manufactured by PROSOCO, Inc., www.prosoco.com, or approved equal.
 2. Subject to compliance with the following minimum performance requirements:
 - a. Comply with national, state and district AIM VOC regulations and contain 50 g/L or less.
 - b. Microabrasion Resistance: Greater than 30 percent improvement over the untreated samples when tested in accordance with ASTM C418.
 - c. Abrasion Resistance: Greater than 40 percent improvement over untreated samples when tested in accordance with ASTM C1353/C1353M.
 - d. Achieve 'High Traction Range' readings when tested in accordance with ANSI B101.1 and ANSI/NFSI B101.3.
 - 1) Coefficient of Friction: 0.60 dry, 0.60 wet when tested in accordance with ASTM C1028.
 - e. Adhesion: Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
 - f. Water Vapor Transmission: 99 percent retained when compared to untreated samples when tested in accordance with ASTM E96/E96M Method B (Water Method).
- C. Color Concentrate for use with Reactive Penetrating Liquid Hardener/Densifier: Water-reducible formulation that penetrates and colors cementitious surfaces.
 1. Basis of Design Product: ColorHard used with Consolideck LS/CS as manufactured by PROSOCO, Inc., www.prosoco.com, or approved equal.
 2. Subject to compliance with the following requirements:
 - a. Living Building Challenge 2.0/2.1 Red List Compliant.
 - b. Recipient of Scientific Certification System (SCS) Indoor Air Quality Gold Certification.
 - c. Comply with national, state and district AIM VOC regulations.
 3. Color(s): As indicated on drawings.

2.04 COATINGS

- A. Medium Gloss Clear Coating: Transparent, non-yellowing, water-based film forming sealer coating.
 - 1. Basis of Design Product: Concolideck PolishGuard as manufactured by PROSOCO, Inc., www.prosoco.com, or approved equal.
 - 2. Subject to compliance with the following requirements:
 - a. Living Building Challenge 2.0/2.1 Red List Compliant.
 - b. Recipient of Scientific Certification System (SCS) Indoor Air Quality Gold Certification.
 - c. Comply with VOC regulations per Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
 - d. Achieve 'High Traction Range' readings when tested in accordance with ANSI B101.1 and ANSI/NFSI B101.3.
 - 1) Coefficient of Friction: 0.60 dry, 0.60 wet when tested in accordance with ASTM C1028.
 - e. Stain Resistance: Achieve limited or no adverse effects when tested in accordance with ASTM D1308.
 - f. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.
- B. Plastic Aggregate: Finely ground polymer for addition to coatings for slip resistance.
 - 1. Products:
 - a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company; EUCO GRIP: www.euclidchemical.com/#sle.
 - c. SpecChem, LLC; Surface Grip: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Sure-Step: www.wrmeadows.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 EQUIPMENT

- A. Auto Scrubber Machine: For cleaning operations.
- B. Burnishing Machine and Diamond Impregnated Burnishing Pads to produce specified results.
 - 1. Burnishing Machine: High speed burnisher, generating pad speeds of 1,500 RPM or higher, as recommended by diamond impregnated burnishing system manufacturer. Dust skirt must be installed at time of work.
 - 2. Diamond Impregnated Burnishing Pads:
 - a. Resin Diamond Pad Grit Sizes: 800, 1500 or 3000 grit.

2.06 CONCRETE MAINTENANCE SUPPLIES

- A. Concrete Maintenance Cleaner: Lithium silicate concentrated maintenance cleaner to keep maintain concrete surface sheen and remove dirt and soils.
 - 1. Consolideck LSKlean ULTRA 30, pre-measured 4 oz packs, manufactured by PROSOCO, Inc., www.prosoco.com.
- B. Floor Maintenance Pads:

1. White floor maintenance pads.
- C. Spill Clean-up Kit: Provide critical cleaning items to remove spills from concrete floors. Spill Clean-up Kit should include the following:
 1. One quart of Consolideck Cleaner Degreaser, one quart of Consolideck Oil and Grease Remover, two pound Spill Guard Neutralizer Absorbent, one package of multi absorbent shop towels, one small plastic scraper, one hand broom and dust pan, a collapsible warning sign, 50 waste bags liners for 24 x 24 can liner, and one box of general purpose vinyl gloves.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor surfaces are acceptable to receive the work of this section.
 1. Concrete substrate shall be structurally sound.
- B. Concrete shall be minimum 28 days old.
- C. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.
- D. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

- A. Clean dirt, dust, oil, grease and other contaminants that interfere with penetration or performance of specified product from surfaces.
- B. Remove remnants of curing compound, bond breaker, and construction laitance prior to application of densifier. Remove by cleaning and scrubbing in accordance with manufacturer's instructions.
- C. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Owner's Representative. Allow repair materials to cure completely before application of product.
- D. Scrub floor with pre-densifier floor cleaner to remove latent salts.
- E. Do not proceed until unsatisfactory conditions have been corrected.

3.03 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.04 COATING APPLICATION

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

- C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.
- D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.05 APPLICATION OF COLOR DENSIFICATION

- A. Areas to be treated:
 - 1. Interior Concrete, where shown on drawings to be colored.
- B. Clean slab after opening up the slab with approved diamond impregnated burnishing pads prior to application of Color Concentrate for reactive, penetrating liquid hardener.
- C. Using low-pressure spray and a conical spray tip, apply enough pre-mixed, ready-to-use Color Concentrate with reactive, penetrating liquid hardener to wet the surface without producing puddles, per manufacturer's published instructions. Do not over apply. Do not atomize. Mix product well and often during application.
- D. Spread the product. Do not overwork or spread once drying begins. For a more mottled appearance, spray-apply without spreading.
- E. On smooth surfaces, spread with a clean microfiber pad prewet with prepared Color Concentrate with reactive, penetrating liquid hardener. Apply in a smooth, irregular pattern to minimize streaks.
- F. Allow the floor to dry for at least one hour. Stay off wet surfaces.
- G. Repeat above steps for increased color intensity and surface hardening.
- H. After drying and final application of color concentrate, burnish slab surface to remove excess color and enhance surface sheen.

3.06 INTERIOR CONCRETE SLAB SURFACE REFINEMENT SYSTEM

- A. Sequential progression of surface refinement shall be required and limited to no more than double the grit value of the previous diamond grit used after application of the concrete hardener/densifier.
- B. Overlap adjacent burnishing passes by 25 percent
- C. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.
- D. Progressively refine surface utilizing approved diamond impregnated burnishing system, to produce Finishing Requirements.

3.07 APPLICATION OF INTERIOR CONCRETE PROTECTIVE TREATMENT

- A. Application of general purpose, medium gloss protective treatment:
 - 1. Apply per manufacturer's published recommendations to clean, dry slab at the completion of refining the slab surface with the high grit diamond impregnated burnishing system. Lightly wet a clean microfiber pad with protective treatment and wring out excess, leaving the pad damp.
 - 2. Spray-apply protective treatment using a clean, pump-up sprayer fitted with a 0.5 gpm conical or fan spray tip at an estimated coverage rate of 400 to 800 square feet per gallon. Work from one control joint to another.

3. Spread with the damp microfiber pad. Maintain a thin, even coating and wet edge. Stop spreading once drying begins. Do not overlap. Repeat steps 1 through 4. Two coats are recommended for maximum protection.
4. To increase gloss, wait at least 60 minutes after the final coat is applied, then use a high-speed burnisher fitted with a white polishing pad. Burnish at a fast walking pace.

3.08 FINISHING REQUIREMENTS

- A. Appearance:
 1. Interior exposed finished slab areas must consist of the following:
 - a. Slab surface must meet the desired sheen, as discussed in Pre-Installation meeting and be consistent with approved Mock-up.
 - b. Slab surface must have a consistent look and exhibit a finish that has no evidence of streaking or burnish marks.
 - c. White residue or hazy appearance is not acceptable.
 - d. Exposure of aggregate beyond CPAA Class B-Fine Aggregate is not acceptable.
 2. Interior exposed finished slab areas must consist of the following CPAA Gloss Level:
 - a. Finished Gloss Level 3 – Semi-Polished Gloss Appearance.

3.09 SLAB PROTECTION

- A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession.
- B. Do not drag or drop equipment or material across the slab which will scratch or chip it.
- C. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.
- D. Clean up spills on slab immediately. Provide cleaning chemicals and absorptive materials.
- E. Develop a concrete protection procedure which addresses the following procedures:
 1. Communication of protection plan to subcontractors and vendors.
 2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.
- F. Provide a clean slab surface using concrete maintenance cleaner within an auto scrubber, equipped with soft nylon brushes, in accordance with manufacturer's published recommendations.

3.10 CONCRETE POLISHING

- A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
 1. Final Polished Sheen: Semigloss finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
 2. Semi-Gloss Finish: Reflecting overhead and side images from 35 to 45 feet away.
- B. Protect finished surface as required and as recommended by manufacturer of polishing system.

3.11 CLOSEOUT ACTIVITIES

- A. Provide and post the laminated methods for maintaining final finish gloss and cleanliness of concrete slab surface within [Room XXX].
- B. Post 16" x 30" Concrete Floor Maintenance Guidelines provided by concrete flooring chemical manufacturer.
- C. Contact PROSOCO, Inc. at 800.255.4255 to obtain colored poster.
- D. Provide facility manager the following concrete floor maintenance supplies:
 - 1. One Spill Clean-Up Kit.
 - 2. Two cases, pre-measured 4 oz Concrete Maintenance Cleaner Packs.
 - 3. 24 Floor Maintenance Pads.

END OF SECTION

SECTION 05 05 19
POST-INSTALLED CONCRETE ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for materials and equipment for post-installed mechanical and adhesive anchors in concrete.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 45 33 - Code-Required Special Inspections: Test reporting.
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.
- D. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- E. Section 05 50 00 - Metal Fabrications.
- F. Divisions 10 - Specialties, 22 - Plumbing, and 26 - Electrical: Mounting of equipment and components.
- G. Other miscellaneous sections, where indicated.

1.03 REFERENCE STANDARDS

- A. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- E. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
- F. ASTM F594 - Standard Specification for Stainless Steel Nuts.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: If requested, manufacturer's product literature and installation instructions for each type of anchor indicated.
- C. Samples: If requested, representative length and diameters of each type of anchor shown on the drawings.
- D. ICC ES Reports: If requested, ICC Evaluation Service report indicating conformance with ICC-ES Acceptance Criteria.
- E. Field quality-control test and inspection reports.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.
- B. Installer Training: Prior to beginning the work, manufacturer or manufacturer's representative shall provide on-site training for all contractor's personnel who will be installing anchors.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's or distributor's original packaging undamaged, and with printed installation instructions.
- B. Store and handle all materials in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products as indicated on the approved Structural Drawings.
- B. Substitutions: Substitutions of products from manufacturer's not listed are not permitted.
 - 1. Substitution of structural anchors requires structural calculations and DSA approval.

2.02 MATERIALS

- A. Interior Use: For use in conditioned environments free from potential moisture, provide zinc plated carbon steel anchors.
- B. Exterior Use:
 - 1. In exposed or potentially wet environments, and for attachment of exterior cladding materials, provide stainless steel anchors.
 - 2. Stainless steel nuts and washers shall be of matching alloy group of equal or greater strength than the rod.
 - 3. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
- C. Deformed Reinforcing Bars: Deformed steel rebar conforming to ASTM A615/A615M Grade 60. Permissible sizes as described in each adhesive products ICC report.

2.03 MECHANICAL ANCHORS

- A. Expansion, screw or undercut anchors having current ICC approval for use in cracked and uncracked concrete, with a published ICC Evaluation Service report.
 - 1. Type and size as indicated on drawings.
- B. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as follows:
 - 1. Hilti, Inc. Tulsa, OK; Hilti Kwik Bolt TZ Carbon and Stainless Steel Anchors in Cracked and Uncracked Concrete (ICC Report ESR-1917); www.us.hilti.com.
 - 2. Simpson Strong Tie Anchor Systems; Simpson Strong-Tie® Strong-Bolt® 2 Wedge Anchor For Cracked And Uncracked Concrete (ICC Report ESR-3037); www.strongtie.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ADHESIVE ANCHORS

- A. Cartridge Injection Adhesive Anchors: Threaded carbon steel rod, inserts, or reinforcing dowels complete with required nuts, washers, adhesive system and manufacturer's installation instructions.
 1. Type and size as indicated on drawings.
 2. Current ICC approval for use in cracked and uncracked concrete with a published ICC Evaluation Service report required.
- B. Interior Use: Unless otherwise indicated on the Drawings, provide:
 1. Carbon steel threaded rods conforming to specification as indicated on structural drawings. Where no specification and grade are indicated, provide: ASTM A193/A193M Type B7 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
- C. Exterior Use: As indicated on the Drawings, provide stainless steel anchors.
 1. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener.
 2. All nuts shall conform to ASTM F594, unless otherwise specified.
- D. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as follows:
 1. Simpson SET-XP Epoxy Adhesive (ICC-ES ESR-2508)
 2. Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit System for anchorage to concrete, ICC ESR-3187.
 3. Hilti HIT-RE 500 V3 Epoxy Adhesive (ICC-ES ESR-3814)
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 POWER-DRIVEN/POWDER ACTUATED FASTENERS

- A. Use only if approved by Architect, generally not permitted where not specifically indicated or in load-bearing installations; as follows.
 1. Hilti, Inc.; Hilti Low Velocity Power Driven Fasteners (ICC Report ESR-1663); www.us.hilti.com.
 2. Simpson Strong-Tie Company, Inc.; Simpson Strong-Tie® Powder-Actuated Fasteners, Threaded Studs and Assemblies (ICC Report ESR-2138); www.strongtie.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions
 1. Base Material Strength: Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.

- a. Adhesive anchors shall be installed in concrete having a minimum concrete compressive strength equal to or greater than the specified minimum 28-day compressive strength or a minimum age of 21 days at time of anchor installation. Whichever are more restrictive.
2. Temperature of concrete surface and ambient air temperature must meet manufacturer's requirements prior to use of adhesive anchor products.
3. Embedded Items:
 - a. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors.
 - b. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
 - c. Take precautions as necessary to avoid damaging anything embedded in the concrete including electrical/telecommunications conduit, gas pipes, and plumbing pipes.
 - d. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling.
4. Beginning of installation indicates acceptance of existing conditions.

3.02 INSTALLATION

- A. Installation shall comply with all manufacturer's instructions and current ICC ESR report.
- B. Post-Installed Anchors in Hardened Concrete.
 1. Drilled-in anchors and/or powder driven pins in existing non-prestressed reinforced concrete: use care and caution to avoid cutting or damaging the existing reinforcing bars.
 2. Maintain a minimum clearance of one inch between the reinforcement and the drilled-in anchor and/or pin.
- C. Manufacturer shall provide on-site training for all personnel who will be installing post-installed adhesive anchors at the beginning of the work. Installation of anchors must be performed by a certified installer.
- D. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically by the Engineer.
- E. Drill holes with rotary impact hammer drills using carbide-tipped bits. Bits must be of type required and permitted by ICC ESR report.
 1. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
 2. Drill bits shall be of diameters as specified by the anchor manufacturer.
 3. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
 4. Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer.
 5. Cored holes may only be used if acceptable to the Engineer and in compliance with ICC ESR report.
- F. Holes shall be cleared of debris after holes are drilled per manufacturer's instructions.

1. For adhesive installations, at a minimum, holes shall be blown out with oil-free compressed air and shall be brushed with a wire or nylon brush.
 2. Holes shall than be blown out one additional time with oil-free compressed air.
 3. Additional hole cleaning requirements may be required by manufacturer and ICC ESR Report.
- G. During adhesive curing time period, the temperature of the substrate shall be kept above the minimum substrate temperature as defined by the manufacturer. Contractor shall determine the appropriate means and methods to ensure that the temperature is kept above the required minimum temperature required before adhesive installation is begun.

3.03 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 45 33 - Code-Required Special Inspections.
- B. Inspection: Special inspection of post-installed anchors shall be provided as required by the ICC-ES report for that anchor and not less than the requirements of the Structural Drawings and the following (whichever is the most restrictive):
1. Continuously observe the installation of all anchors, or as specified in the ICC report.
 - a. Minimum anchor embedments, proof loads and torques shall be as shown on the Drawings.
 - b. Load Testing: Per Structural General Notes on Drawings.
 - c. Post-Installed Anchor Load Testing: CBC Section 1910A.5.
 - 1) As indicated on Structural Drawings, minimum 10 % of drilled-in sill plate bolting anchor applications shall be proof loaded by the independent testing laboratory.
 - 2) 100 % of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory.
 - 3) Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Architect.
 - 4) Tension testing should be performed in accordance with ASTM E488/E488M.
 - 5) Torque shall be applied with a calibrated torque wrench.
 - 6) Proof loads shall be applied with a calibrated hydraulic ram, as required and indicated on the Structural Drawings. Comply with CBC 1910A.5.
 - 7) If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Architect.
 - d. Verify anchor type, anchor dimensions, hole dimensions, anchor spacing, edge distances, anchor embedment and adherence to the manufacturer's published installation instructions.
 - e. For adhesive anchors also verify hole cleaning technique, adhesive expiration date and proper mixing and dispensing.
 2. Subsequent inspection of installation will be required when there is a change of personnel doing the installation. Change is defined as any one or more persons drilling or preparing holes, or installing anchors.

3. Visually inspect 100% of all installed anchors.
- C. Reporting:
 1. Daily reports shall reference the applicable ICC-ES report number, indicate that all specified criteria were complied with and provide itemized verification of all inspected items.
 2. Special Inspector shall immediately report any deviations from the requirements to the Architect.
- D. Defective Work:
 1. Installations that are not accepted by the Special Inspector shall be considered defective.
 2. Provide additional testing and inspection to determine acceptability of defective work, as directed by the Architect at Contractor's expense.

3.04 REPAIR OF DEFECTIVE WORK

- A. Remove and replace misplaced, defective or malfunctioning anchors at Contractor's expense. Replacement of anchors requires signed structural detail, unless otherwise noted.
- B. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink non-metallic grout.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel stud exterior wall framing.
- B. Formed steel slotted channel framing and bridging.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Insulation within framing members.
- B. Section 07 25 00 - Weather Barriers: Weather barrier over sheathing.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings.
- D. Section 07 92 00 - Joint Sealants.
- E. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.
- F. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.
- G. Section 09 22 36 - Lath.
- H. Section 09 24 00 - Cement Plastering.
- I. Section 09 51 00 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 1. Use 2013 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 1. Use 2014 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- G. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- I. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
 1. Use 2008 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- J. PS 1 - Structural Plywood.
 1. Use 2009 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .
- E. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Characteristics of products manufactured by members of the Steel Stud Manufacturers Association, ICC Report Nos. ESR-3064P, are indicated to establish a level of quality and performance.
- B. Metal Framing:
 1. CEMCO: www.cemcosteel.com/#sle.
 - a. ICC ESR-3016.
 - b. ICC ESR-2012.
 - c. Intertek CCRR-0224.
 2. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - a. Intertek CCRR-0206.

- b. Intertek CCRR-0224.
- 3. Marino: www.marinoware.com/#sle.
 - a. ICC ESR-4062.
- 4. Steel Stud Manufacturers Association www.ssma.com.
 - a. ICC ESR-3064P applies to manufacturers below.
 - b. California Expanded Metal Products, (CEMCO) www.cemco.com.
 - c. Building Products Division of Consolidated Fabricators Corp., Paramount, CA: www.confabbpd.com.
 - d. Scafco Corporation, Stockton, CA: www.scafco.com.
 - e. United Metal Products, Inc., Corona, CA: www.unitedmetalproducts.info.
- 5. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Framing Connectors and Accessories:
 - 1. Same manufacturer as metal framing.
 - 2. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - 3. Simpson Strong Tie: www.strongtie.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
 - 1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
 - 2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
 - 3. Design Loads: In accordance with applicable codes.
 - 4. Live load deflection meeting the following, unless otherwise indicated:
 - a. Floors: Maximum vertical deflection under live load of 1/480 of span.
 - b. Roofs: Maximum vertical deflection under live load of 1/240 of span.
 - c. Roofs Supporting Plaster Ceiling or Soffit: Maximum vertical deflection under live load of 1/360 of span.
 - d. Exterior Walls with Flexible Finish: Maximum horizontal deflection under wind load of 1/180 of span.
 - e. Exterior Walls with Masonry Veneer: Maximum horizontal deflection under wind load of 1/600 of span.
 - f. Exterior Walls with Plaster Finish: Maximum horizontal deflection under wind load of 1/360 of span.
 - g. Exterior Walls with other Brittle Finish: Maximum horizontal deflection under wind load of 1/240 of span.

- h. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
- 5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- 6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.03 FRAMING MATERIALS

- A. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gauge and Depth: As indicated on drawings.
 - a. Maximum 18 Gage and Lighter: ASTM A653/A653M SS Grade 33, types, sizes as indicated on Drawings, punched web unless otherwise indicated, with screw type flanges.
 - b. 16 Gage and Heavier: ASTM A653/A653M SS Grade 50, Class 1, types, sizes as indicated on Drawings, punched web unless otherwise indicated, with screw type flanges.
 - 2. Top Track (Fire Rated): Where fire or smoke rated walls are required, provide components UL-listed for use in UL-listed fire-rated head of partition joint systems specified in this section.
 - a. Option 1:
 - 1) Slotted Track with integrated intumescent fire protection, same gage and material as wall framing or 16 gage, whichever is more restrictive. Provide dynamic joint fire protection with UL listed intumescent assembly.
 - (a) Products
 - (1) CEMCO: "FAS Track"; www.cemcosteel.com, ICC-ES ESR-2012.
 - (2) Brady Sliptrack Systems: "FAS Track"; www.sliptrack.com, ICC-ES ESR-2012.
 - (3) Ware Industries, Inc. (dba Marinoware): "CST"; www.marinoware.com, ICC-ES ESR-2012.
 - (4) BlazeFrame: Product "BlazeFrame"; www.blazeframe.com.
 - b. Option 2:
 - 1) At 1 and 2 hour conditions, provide field applied dynamic joint fire protection with UL listed intumescent assembly CEMCO "HOT ROD Type X", or equal assembly.
 - 3. Top Track (Non-Rated): At non-rated walls use Slotted Track CST by CEMCO, City of Industry, CA (800) 375-2362, ICC Report No. ESR-2012, or approved equal, same gage and material as wall framing or 16 gage, whichever is more restrictive.
 - 4. Bottom Track: Same gage and material as wall framing plus one gage or 20 gage, whichever is more restrictive, 1-1/2 inch leg unless noted otherwise, width to suit stud width.
 - a. Provide extended leg tracks at sill tracks where flooring underlayment will be placed (poured) after wall framing.

5. Sills and Headers: Unpunched channels sized for stud flanges, gage the same as studs unless otherwise noted. Provide extended leg tracks at ceiling tracks under structural framing members.
6. Galvanized in accordance with ASTM A653/A653M, G60/Z180 coating, hot dipped.
 - a. Provide minimum G60 coating for applications other than interior non-loadbearing walls.
 - b. Provide minimum G40 coating for interior non-loadbearing wall applications.
7. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).
8. Products:
 - a. CEMCO; ProX Header: www.cemcosteel.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Jamb Studs: Engineered, C-shaped with wide flanges, designed to replace conventional double-stud framing at openings.
- C. Header: Engineered one-member or two-member assembly, with wide flanges, designed to replace conventional box or nested header framing at openings.
 1. Jamb Mounting Clips: Manufacturer's standard.
- D. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G60/Z180 hot dipped galvanized coating.
 1. Base Metal: Structural Steel (SS), Grade 50/340, Class 1.
 2. Gauge and Depth: As indicated on drawings.
- E. Framing Connectors: Factory-made, formed steel sheet.
 1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gauge, 0.1345 inch, and factory punched holes and slots.
 2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
 - a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - c. Provide top track with long leg track and head of wall movement connectors; minimum track length of 10 feet.
 - d. Products:
 - 1) Slotted Track CST by CEMCO, City of Industry, CA (800) 375-2362, ESR-2012.
 - 2) ClarkDietrich; Drift FastClip Slide Clip D-FCSC: www.clarkdietrich.com/#sle.

- 3) Simpson Strong Tie: www.strongtie.com/#sle.
 - 4) Slotted deflection track by Sliptrak Systems. ESR-2012
 - 5) VertiClip(r) or DriftClip(tm) manufactured by The Steel Network Inc. ESR-2049.
 - 6) Super Stud Building Products, Inc; Deflection Clips:
www.buysuperstud.com/#sle.
 - 7) Substitutions: See Section 01 60 00 - Product Requirements.
4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
 - a. Products:
 - 1) Simpson Strong Tie: www.strongtie.com/#sle.
 5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings and per Steel Stud Manufacturers Association standards, whichever is greater.
 6. Products:
 - a. ClarkDietrich; FastBridge Clip: www.clarkdietrich.com/#sle.
 - b. Simpson Strong Tie: www.strongtie.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FASTENERS

- A. Provide bolts, nuts, screws, powder driven fasteners, clips, washers and other fasteners as indicated on Drawings and as necessary for proper erection of items specified herein.
- B. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- C. Bolts and nuts: ASTM A307.
- D. Anchorage Devices: Powder actuated, Drilled expansion bolts, and Screws with sleeves.
- E. Welding: Comply with AWS D1.1/D1.1M.
 1. Welding Electrodes: As permitted by AWS D1.1/D1.1M and AWS D1.3/D1.3M.

2.05 WALL SHEATHING

- A. Plywood; PS 1, Grade C-D, Exposure I.
- B. Gypsum Board Wall Sheathing: See Section 09 21 16.

2.06 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components; as indicated on Drawings.
 1. Bridging: 16 gage, unless noted otherwise.
 2. Standard Structural Steel Shapes and Plates: ASTM A36/A36M.
 3. Miscellaneous Steel Items: ASTM A283/A283M, grade optional.
 4. Flat-Rolled Carbon Steel Sheets: ASTM A1008/A1008M.
 5. Cold-Rolled Carbon Steel Sheets: ASTM A1008/A1008M.

- 6. Backing Plates: Galvanized sheet metal for attachment and support of products to be attached to framing.
 - a. 16 gage material covering full width of stud spacing by 6-inches wide minimum, unless indicated otherwise on Drawings.
 - b. As indicated on Drawings.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
 - 1. Comply with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- C. Incidental Steel Shapes and Framing:
 - 1. Provide specified, indicated and required clips, plates, bent plates, angles, channels, etc., to secure the materials, equipment and items of other trades not supplied by them but necessary for the completion of Work.
 - 2. This Section is not intended to specify each item of cold-formed structural metal framing individually.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- E. Water-Resistive Barrier: As specified in Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

- A. Configuration: Place and align tracks and install framing to configurations indicated on Drawings.
- B. Install components in accordance with Steel Stud manufacturers' instructions and ASTM C 1007 requirements.
- C. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
 - 1. Align studs with joists and decking flutes, as applicable.
 - 2. Use fasteners as specified in Section 05 50 00 - Metal Fabrications, for concrete, masonry and steel construction.
- D. Place studs at 16 inches on center, or as indicated on Drawings; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.
 - 1. Install studs at 12-inches on center in plumbing walls and walls receiving ceramic tile finish.
- E. Construct corners using minimum of three studs. Install double studs at wall openings over 24 inches, door and window jambs.
- F. Install studs full length in one piece. Splicing of studs is not permitted.

- G. Install studs, brace, and reinforce to develop full strength and achieve design requirements.
- H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- I. Install intermediate studs above and below openings to align with wall stud spacing.
- J. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- K. Attach backing plates to studs for attachment of fixtures anchored to walls.
- L. Coordinate erection of studs/joists with installation of service utilities to minimize discontinuity in framing. Align stud web openings.
- M. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- N. Recesses: Provide framed openings for all recessed components. Coordinate erection of framing with installation of bucks, anchors, backing, blocking, plumbing, mechanical and electrical components to provide necessary clearances and supports for recessed products. Coordinate erection of framing with requirements for door and window frame supports and attachments.
- O. Backing and Blocking: Install sheet metal backing as indicated and as required to support all products attached to wall or ceiling after completion of finish surface, including toilet accessories, plumbing fixtures, electrical fixtures, electrical panels, toilet partitions, casework, kitchen equipment, hardware, equipment, handrails, and trim. Cut ends of runner and backing plates to each stud.
- P. Stud Lateral Bracing: Provide bracing as indicated on Drawings.
- Q. Stud Bridging General: Brace studs and joists with bridging to make rigid.
 - 1. Cut bridging to fit between, and welded to, studs or inserted through cutouts in the web of each stud and secured to studs with welded clip angles. Provide bridging as indicated on Drawings.
 - 2. Provide bridging as indicated on Drawings. If not indicated, provide bridging per UL Assembly listing and Steel Stud Manufacturing Association Standards, ICC Report No. ER-3064P Product Technical Guide.
- R. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with Steel Stud Manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Place joists at 12 inches on center; not more than 2 inches from abutting walls, and connect joists to supports using fastener method.
- D. Set ceiling joists parallel and level, with lateral bracing and bridging.
- E. Joist Bearing: Provide uniform and level joist bearing at supporting member by means of shims. At masonry and concrete conditions, provide non-shrink grout in addition to shims.
- F. Locate joist end bearing directly over load-bearing studs or provide load distributing member to top of stud track.

1. Doubled Joists: Provide additional joists under parallel partitions when the partition length exceeds one-half the joist span and around all floor and roof openings, which interrupt one or more, spanning members unless otherwise indicated.
 2. Provide doubled ceiling joists over all partitions running parallel with the joists.
 3. Joists shall have at least 1-1/2 inches of bearing and shall be reinforced over bearings to prevent web crippling.
- G. End Blocking: Provide end blocking where joist ends are not otherwise restrained from rotation.
- H. Provide web stiffeners at reaction points, where indicated on Drawings.
1. Provide web stiffeners at blocking at supports and points of concentrated loads.
- I. Touch-up field welds with cold-galvanizing compound and damaged galvanized surfaces with primer.

3.04 COLD-FORMED STRUCTURAL METAL FRAMING ERECTION

- A. Erection, General: Conform to ASTM C955 for bracing and bridging for screw application of gypsum board, gypsum sheathing and plaster lath.
- B. Coordination: Coordinate framing with adjoining Work. Drill holes; do not punch or use cutting torch. Shearing shall leave clean lines and surfaces.
- C. Cutting: Cut framing components squarely for attachment to perpendicular members or, as required, for an angular fit against abutting members.
- D. Prefabricated Sections: Lift, handle and place prefabricated sections of framing in a manner as to not cause distortion in members.

3.05 COLD-FORMED METAL STUD ERECTION

- A. Runner Tracks: Securely anchor runner tracks to supporting structure as shown on Drawings.
1. Runner Track Joints: Secure abutting pieces of runner track to a common structural element.
- B. Stud Erection: Place studs in tracks plumb and aligned and securely attach to flanges of both upper and lower runner tracks.
- C. Lateral Bracing: Provide lateral bracing by use of gypsum board and gypsum sheathing in accordance with AISI specification or provide horizontal strap bracing, as indicated.
- D. Vertical Movement Provisions: Provide for structure vertical movement.

3.06 COLD-FORMED METAL STUD ERECTION, AXIAL LOAD-BEARING

- A. Runner Tracks: Securely anchor runner tracks to supporting structure as shown on Drawings. Provide complete uniform and level bearing support for bottom runner track.
- B. Runner Track Joints: Secure abutting pieces of runner track to a common structural element or splice and butt-weld together.
- C. Stud Erection: Place studs in tracks plumb and aligned and with full bearing of end of stud to track web. Securely attach stud to flanges of both upper and lower runner tracks by screwing or welding for full width of stud flange.

- D. Jack Studs or Cripples: Provide jack studs and cripples below window sills, above window and door heads, and elsewhere to furnish supports for products to be installed in openings. Securely attach jack studs and cripples to supporting members.
- E. Temporary Bracing: Provide temporary bracing as required until erection is completed.
- F. Lateral Bracing: Resistance to minor axis bending and rotation shall be provided by gypsum board and gypsum sheathing in accordance with AISI specification or by horizontal strap bracing as indicated.
- G. Splices: Make no splices in axially loaded studs.

3.07 INSTALLATION OF WALL SHEATHING

- A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
 - 1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
 - 2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

3.08 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation of any Member from Plane: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 05 19 - Post-Installed Concrete Anchors: Placement of metal anchors in concrete.
- C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.
- D. Section 09 91 13 - Exterior Painting: Paint finish.
- E. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance.
- G. ASTM A606/A606M - Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- J. ASTM A847/A847M - Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
- K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- L. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

- N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- P. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- Q. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel.
- R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- T. SSPC-SP 3 - Power Tool Cleaning.
- U. SSPC-SP 5 - White Metal Blast Cleaning.
- V. SSPC-SP 6 - Commercial Blast Cleaning.
- W. SSPC-SP 10 - Near-White Blast Cleaning.
- X. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- 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.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Conform to applicable requirements of California Building Code (CBC), Title 24, Part 2, as amended and adopted by authorities having jurisdiction.
 - 1. Comply with Title 24, Part 9, California Fire Code Chapter 35 "Welding and Other Hot Work."

2.02 MATERIALS - STEEL

- A. Structural Steel: ASTM A992/A992M.
 - 1. Galvanized Steel: From fully killed or semi-killed steel, except silicon content in the range 0 to 0.4 percent or 0.15 to 0.25 percent, as applicable, only.
- B. Steel Sections: ASTM A36/A36M, for channels, angles and plates.
- C. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Weathering Steel: Corten B, ASTM A588/A588M and/or ASTM A606/A606M.

1. Up to 3/16 inch: ASTM A606/A606M.
 2. 3/16 inch to 5 inch: ASTM A588/A588M.
 3. Tube: ASTM A847/A847M.
- H. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- I. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- J. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- K. Bolts, Nuts, and Washers: As indicated on Drawings.
- L. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- M. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
1. Comply with SSPC-PA 1. Coordinate with requirements specified in Section 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting .
 - a. Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.
- N. Galvanize all exterior steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
- O. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Ferrous Metal Surfaces, General:
1. For metal fabrications exposed to view upon completion of the Work: Provide ferrous metals materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 2. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Hot-dip galvanize fabricated ferrous items, indicated as remaining unpainted, after fabrication. Field connections shall be bolted or screwed where possible. Avoid field cutting and welding which damage galvanized coating.
- C. Fit and shop assemble items in largest practical sections, for delivery to site.
- D. Fabricate items with joints tightly fitted and secured.
- E. Gas cutting of non-structural steel items may be acceptable where stress is not transmitted through flame-cut surfaces.
1. Make cuts clean and to contour.
 2. Deduct 1/8 inch from effective width of members cut by torch.
- F. Continuously seal joined members by intermittent welds and plastic filler.
- G. Joints Exposed to Weather or Water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.

- H. Steel Tubing and Piping Fabrication: Unless otherwise indicated, close ends with plate stock so no exposed ends of tubing and piping. Grind all edges.
- I. Connections, General:
 - 1. Component parts of built-up members shall be well-pinned with closely-fitted contact.
 - 2. Conceal connections where possible.
 - 3. Otherwise, make countersinks for concealment after fabrication, except where noted.
- J. Welding: Conform to AWS D1.1/D1.1M recommendations.
 - 1. Do not field weld galvanized components to remain unfinished.
 - 2. Provide continuous welds at welded corners and seams.
 - 3. Grind exposed welds smooth and flush with base material.
 - 4. Re-weld to fill holes. Putties and fillers are not acceptable.
- K. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- L. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
 - 1. Bolted and Screwed Connections:
 - a. Provide holes and connections for work specified in other Sections.
 - b. Use bolts for field connections only.
 - c. Provide washers under heads and nuts bearing on wood.
 - d. Draw all nuts tight and nick threads of permanent connections.
 - e. Use beveled washers where bearing is on sloped surfaces.
 - f. Where screws must be used for permanent connections in ferrous metal, use flat head type, countersunk, with screw slots filled and finished smooth and flush.
- M. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Rough Hardware
 - 1. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as indicated on Drawings.
- B. Other Products and Fabrications
 - 1. Other Products and Fabrications: Provide all materials not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to review and acceptance by Construction Manager and Architect.
- C. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; electro-galvanized per ASTM B633, Type III, SC 1 finish.

2.05 FINISHES - STEEL

- A. Mechanical Finishes: Complete finishing prior to fabrication wherever possible.

1. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match finish.
2. Protect finish on exposed surfaces by using temporary protective covering.
- B. Prime paint steel items.
 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- C. Prepare surfaces to be primed in accordance with SSPC-SP2.
 1. Exterior fabrications: Clean in accordance with SSPC-SP 5, SSPC-SP 6, 8, or SSPC-SP 10.
 2. Interior fabrications: Clean in accordance with SSPC-SP 2, SSPC-SP 3, SSPC-SP 5, SSPC-SP 6, 8, or SSPC-SP 10.
- D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- E. Prime Painting: One coat.
- F. Galvanizing of Non-structural Items: Galvanize all exterior steel members after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.
- F. Punch, drill and reaming in manner to leave clean, true lines and surfaces.
 1. Oversize hole 1/16 inch by punching, when material thickness is equal to or less than bolt diameter plus 1/8 inch.
 2. Sub-punch 1/16 inch smaller than bolt and drill or ream to oversize by 1/16 inch, when material thickness is thicker than bolt diameter plus 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.
- C. Environmental Conditions: Do not install products intended for interior locations when spaces are uncovered and unprotected from inclement weather.
- D. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Obtain Architect's review prior to site cutting or making adjustments not indicated on Drawings and reviewed shop drawings.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

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

END OF SECTION

SECTION 06 10 63
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treated wood materials.
- B. Communications and electrical room mounting boards.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood.
- E. PS 1 - Structural Plywood.
- F. PS 20 - American Softwood Lumber Standard.
- G. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.

2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 1. Lumber: S4S, No.2 or Standard Grade.
 2. Boards: Standard or No.3.

2.03 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWP A standards.
- B. Preservative Treatment:
 1. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 lb/cu ft retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

- b. Treat lumber in contact with concrete.
- c. Treat lumber less than 18 inches above grade.
- d. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

3.04 INSTALLATION OF CONSTRUCTION PANELS

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

3.05 CLEANING

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

- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.
- D. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.
- E. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard.
- B. ANSI A208.1 - American National Standard for Particleboard.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- E. AWP A U1 - Use Category System: User Specification for Treated Wood.
- F. BHMA A156.9 - American National Standard for Cabinet Hardware.
- G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- H. NEMA LD 3 - High-Pressure Decorative Laminates.
- I. PS 1 - Structural Plywood.
- J. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork.
- K. WI (MCP) - Monitored Compliance Program (MCP).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

2. Provide instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 2. Provide the information required by AWMAC/WI (NAAWS).
 3. Include certification program label.
- D. Samples: Submit two samples of finish plywood, 6 by 8 inch in size illustrating wood grain and specified finish.
- E. Samples: Submit two samples of wood trim 6 inch long.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 1. Comply with WI (MCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section www.woodworkinstitute.com/#sle.
 2. Provide labels or certificates indicating that the work complies with AWMAC/WI (NAAWS) requirements for grade or grades specified.
 3. Provide designated labels on shop drawings as required by certification program.
 4. Provide designated labels on installed products as required by certification program.
 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Any closed-grain hardwood; prepare for paint finish.

2.02 LUMBER MATERIALS

- A. Softwood Lumber: Douglas Fir species, S4S sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
- B. Hardwood Lumber: Drawing indicated species, S4S sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

- A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.
- D. Particleboard: ANSI A208.1; Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
- E. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

2.04 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish.
- B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.
- C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.05 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B. Fasteners: Of size and type to suit application; blind finish in concealed locations and Architect selected finish in exposed locations.
- C. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Lumber for Shimming and Blocking: Softwood lumber of indicated species.
- C. Plastic Edge Trim: Extruded convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness; color as selected.
- D. Aluminum Edge Trim: Extruded convex shape; smooth surface finish; self locking serrated tongue; of width to match component thickness; bronze anodized finish.
- E. Primer: Alkyd primer sealer.

- F. Wood Filler: Oil base, tinted to match surface finish color.

2.07 HARDWARE

- A. Hardware: Comply with BHMA A156.9.

2.08 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.
- C. Water Repellent Preservative Treatment by Dipping Method: WDMA I.S. 4, with 0.25 percent retainage.
- D. Wood Preservative (Surface Application): Clear, Woodlife Classic type, Tris-2,4,6-(Dimethylaminomethyl) Phenol manufactured by Rust-Oleum Corporation.
- E. Shop pressure treat wood materials requiring preservatives to concealed wood blocking.
- F. Provide identification on fire retardant treated material.
- G. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
- H. Redry wood after pressure treatment to maximum 19 percent moisture content.

2.09 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Cap exposed plastic laminate finish edges with plastic trim.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- F. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.10 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 12, Polyurethane, Water-based.
 - b. Stain: As selected by Architect.

- c. Sheen: Satin.
- 2. Opaque:
 - a. System - 4, Latex Acrylic, Water-based.
 - b. Color: As selected by Architect.
 - c. Sheen: Satin.
- E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install work in accordance with AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.
- C. Set and secure materials and components in place, plumb and level.
- D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- E. Install components with nails at 12 inch on center.
- F. Install prefinished paneling with full bed contact adhesive applied to substrate.
- G. Install hardware in accordance with manufacturer's written instructions.

3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 91 23.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.05 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units. PL-1, PL-2
- B. Hardware.
- C. Factory finishing.
- D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 20 00 - Finish Carpentry: Wood trim unrelated to casework.
- C. Section 09 21 16 - Gypsum Board Assemblies: Support framing, grounds, and concealed blocking.
- D. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

- A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware.
- C. NEMA LD 3 - High-Pressure Decorative Laminates.
- D. WI (CCP) - Certified Compliance Program (CCP).
- E. WI (MCP) - Monitored Compliance Program (MCP).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 3. Include certification program label.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Spare Parts: One of each kind of lock.
 - 3. Extra Stock Materials: six keys of each kind of lock.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
 - a. A Licensee of the Woodwork Institute's Certified Compliance Program.
 - 3. Single Source Responsibility: Provide and install this work from single fabricator.
- B. Quality Certification:
 - 1. Comply with WI (MCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section:
<https://woodworkinstitute.com/#sle>.
 - 2. Provide labels or certificates indicating that the installed work complies with AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - a. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
 - b. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - a. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
 - 6. All fees charged by the Woodwork Institute for their Certified Compliance program are the responsibility of the millwork manufacturer and/or installer and shall be included in the bid.
 - 7. Replace, repair, or rework all work for which certification is refused.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Wall hung cabinets and floor supported cabinets over 5 feet high shall be braced and anchored in accordance with the California Building Code (CBC) Title 24 Part 2, Table 1607A.1.
 - 1. Comply with OHSPD Pre-Approval OPM-0092.
- B. Requirements for Persons with Disabilities: Provide products meeting requirements of California Code of Regulations (CCR), Title 24, Part 2, Chapter 11B and ADA Accessibility Guidelines for Buildings and Facilities, latest amendment.
 - 1. Operable parts for all accessible casework shall comply with CBC Section 11B-309 Operable Parts.
 - 2. Pull hardware shall be U-shaped wire pulls or equally accessible at all accessible casework; CBC 11B-811.4 Operable Parts.

2.02 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
 - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 - 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 3. Finish - Semi-Exposed Surfaces: Cabinet Liner.
 - a. Cabinet interiors (other than exposed interior surfaces of open or glass front cabinets) including faces of shelving therein, and interior door faces.
 - 4. Finish - Concealed Surfaces: Manufacturer's option.
 - 5. Door and Drawer Front Edge Profiles: Square edge with thick applied band.
 - a. Provide with subfronts and applied finish fronts securely fastened, with square corners, edges finished with 3 mm purified PVC.
 - b. Doors, Drawer Fronts, and False Fronts: 3 mm purified PVC edge band, color and pattern to match exposed laminate, hot-melt applied.
 - c. All other exposed and semi exposed edges: 1 mm PVC edge band, color and pattern to match exposed laminate.
 - 6. Door and Drawer Front Retention Profiles: Fixed panel.
 - 7. Casework Construction Type: Type A - Frameless.

8. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
 - a. Hinged to swing flat against the face of adjoining cabinet or the side of cabinet
 - b. Do not notch door or cabinet ends, or divisions to receive hinge.
9. Patterned Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
10. Cabinet Design Series: As indicated on drawings.
 - a. Base Cabinets without drawers: 100 series.
 - b. Base Cabinets with drawers: 200 series.
 - c. Wall hung Cabinets: 300 series.
 - d. Tall Storage Cabinets: 400 series.
 - e. Wardrobe Cabinets: 500 series.
 - f. Library Cabinets: 600 series.
11. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 - a. Deflection: L/144.
 - b. Shelves: 1-M-2 particle board, 1 inch thick, MOE of 950.
 - c. Edge Bands: 1 mm PVC in color to match shelf. All 4 edges of adjustable shelves to receive banding.
12. Cabinet Style: Flush overlay.
13. Cabinet Doors and Drawer Fronts: Flush style.
14. Drawer Side Construction: Multiple-dovetailed.
15. Drawer Construction Technique: As recommended by fabricator.

2.03 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Lumber shall be sound, kiln dried softwood and/or hardwood meeting the requirements of the NAAWS Grade specified for its intended purpose.
- C. Panels shall contain no added urea-formaldehyde resins and shall be in accordance with the NAAWS requirements for the grade specified.
 1. Veneer: HPVA grade to meet the NAAWS requirements for type of surface and grade.
 2. Core: Comply with NAAWS.
 - a. Basis of Design Material: Combination Core, PureBond Classic Core, www.columbiaforestproducts.com, or approved equal.

2.04 LAMINATE MATERIALS

- A. Manufacturers:
 1. Arborite: www.arborite.com/#sle.
 2. Abet - Laminati: www.abetlaminati.com
 3. Formica Corporation: www.formica.com/#sle.
 4. Lamin-Art: www.laminart.com.

5. Panolam Industries International, Inc; Nevamar Standard HPL: www.panolam.com/#sle.
 6. Panolam Industries International, Inc; Pionite Standard HPL: www.panolam.com/#sle.
 7. Wilsonart LLC: www.wilsonart.com/#sle.
 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.
1. Manufacturers:
 - a. Wilsonart LLC: www.wilsonart.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- D. Provide specific types as indicated.
1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color as selected, finish as selected.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, color as selected, finish as selected.
 3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, color as selected, finish as selected.
 4. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, color as selected, finish as selected.
 5. Cabinet Liner: CLS, 0.020 inch nominal thickness, color as selected, finish as indicated.
 6. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.05 COUNTERTOPS

- A. Countertops are specified in Section 12 36 00.

2.06 ACCESSORIES

- A. Adhesive: Type recommended by NAAWS to suit application.
1. Urea Formaldehyde adhesives shall not be used.
 2. Contact cement shall have a VOC content of less than 80 g/l.
 3. Construction adhesive shall have a VOC content compliant with Section 01 61 16.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: As selected by Architect from manufacturer's standard range.
 2. Use at all exposed plywood edges.
 3. Use at all exposed shelf edges.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: Standard plastic, painted metal, stainless steel, or chrome plated grommets for cut-outs, in color to match adjacent surface.
 - 1. Basis of Design Product: TG Flip-Top® Series as manufactured by Doug Mocket & Company, Inc., or approved equal.
 - a. Application: desk, countertop, or worksurface grommets.
 - b. Hole Diameter: 3 inches.
 - c. Type: Flip Top.
 - d. Color as selected by Architect.
 - e. Location as directed by Architect or District. Final location and color to be indicated on shop drawing submittal.
- G. Air Vent:
 - 1. Basis of Design Product: GTMesh1/4x8 - GT Grille Mesh1 as manufactured by Doug Mocket & Company, Inc., or approved equal.
 - a. Application: Equipment or other cabinet venting.
 - b. Size: 4 x 8 inches.
 - c. Type: Painted Metal.
 - d. Color as selected by Architect.
 - e. Location: 2 inches above bottom shelf and 2 inches below drawer (if provided).
 - 1) Final location to be verified on shop drawing submittal.

2.07 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
 - 1. Locking 3/4-inch plastic shelf supports for 5mm hole diameter.: Knappe & Vogt Manufacturing Company; Product No. 339: www.knappeandvogt.com.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
 - 1. Comply with CBC 11B-811.4.
 - 2. Amerock: BP76312-G10, 4 inch Pull, Allison Value Hardware
 - 3. Rockler: Satin Nickel 4 inch Wire Pull.
 - 4. Top Knob: M338 - Wire Pull 4 inch - Brushed Satin Nickel - Somerset Collection
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
 - 1. Provide locks on all cabinet doors and drawers, except accessible sink bases.
 - 2. Locks for doors and drawers shall be keyed alike for each room and master keyed.
 - 3. Metal Strike Plates: Provide cabinet door and drawer locks with metal strike plates to protect against particle board rip out.

4. Door and drawer locks shall be of pin tumbler design and include working cylinder slides and forwardly removable cylinder to re-key without totally disassembling lock body and passed by ANSI Grade 1 testing.
 5. Locks shall be easily rekeyable pin tumbler with working top slide and retainer staple.
 6. Cabinet Locks:
 - a. Olympus Lock; Product 500DR: www.olympus-lock.com.
 - b. Corbin Cabinet Lock; Product 0737 Drawer Lock: www.cclsecurity.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 7. Drawer Locks:
 - a. Olympus Lock; Product 600DW: www.olympus-lock.com.
 - b. Corbin Cabinet Lock; Product 0738 Drawer Lock: www.cclsecurity.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Catches: Magnetic.
1. Catches for Doors Without Locks: Magnetic with aluminum case.
 - a. Amerock; Product No. 145: www.amerock.com.
 - b. The Engineered Products Co.; Product EP591: www.epcohardwaresecurity.com.
 - c. Stanley Architectural Hardware; Product CD46.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Catches for Inactive Leaf of Pairs of Doors With Locks: Elbow catch.
 - a. Amerock; Product E.Z. Flex No. 3675-2G: www.amerock.com.
 - b. The Engineered Products Co.; Product No. 1016: www.epcohardwaresecurity.com.
 - c. Ives; Product 2-A92: www.iveshinges.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Drawer Slides:
1. Type: Full extension, no deflection.
 2. Static Load Capacity: As required by drawer size.
 - a. For drawers up to 18 inches wide and less than 4 inches in depth, provide slides with 100 pound capacity.
 - b. For drawers over 18 inches in width and over 4 inches in depth, provide slides with 150 pound capacity.
 - 1) Drawer slide capacity with paper storage: 200 pounds.
 3. Mounting: Side mounted.
 4. Stops: Positive type.
 5. Features: Provide self closing/stay closed type.
 6. Manufacturers:
 - a. Accuride International, Inc; Light-Duty Drawer Slides: www accuride.com/#sle.
 - b. Accuride International, Inc; Heavy-Duty Drawer Slides: www accuride.com/#sle.
 - c. Grant Hardware Company, Division of Hettich International: www.hettichamerica.com.
 - d. Hettich America, LP: www.hettich.com/#sle.

- e. Knapé & Vogt Manufacturing Company; Light-Duty Drawer Slides:
www.knapvandvogt.com/#sle.
 - f. Knapé & Vogt Manufacturing Company; Medium-Duty Drawer Slides:
www.knapvandvogt.com/#sle.
 - g. Knapé & Vogt Manufacturing Company; Heavy-Duty Drawer Slides:
www.knapvandvogt.com/#sle.
 - h. Substitutions: See Section 01 60 00 - Product Requirements.
- G. File Drawer Slides and accessories:
- 1. Type: Full extension.
 - 2. Static Load Capacity: Extra Heavy Duty grade.
 - a. Provide 150 pound capacity.
 - b. Lateral file drawers more than 24 inches wide: 200 pound capacity
 - 3. Mounting: Side mounted.
 - 4. Stops: Positive type. 3-section slide, 1/2 inch slide space.
 - 5. File Drawer Track and Follower: K&V 476T ZC and K&V 476F ZC or equal.
 - 6. Features: Provide self closing/stay closed type with rolling balls, steel rollers and self-lubricating bearings.
 - 7. Manufacturers:
 - a. Accuride International, Inc: www accuride.com.
 - b. Grant Hardware Company Division of Hettich International:
www.hettichamerica.com.
 - c. Knapé & Vogt Manufacturing Company: www.knapvandvogt.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Hinges: Butt self-closing type, BHMA No. A156.9 level, Grade 1, steel with polished finish.
- 1. Manufacturers:
 - a. Blum, Inc; COMPACT BLUMOTION: www.blum.com/#sle.
 - b. Grass America Inc: www.grassusa.com/#sle.
 - c. Hafele America Co.; : www.hafele.com.
 - d. Hardware Resources: www.hardwareresources.com/#sle.
 - e. Hettich America, LP: www.hettich.com/#sle.
 - f. Stanley Hardware Div.: www.stanleycommercialhardware.com.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 SITE FINISHING MATERIALS

- A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWMAC/WI (NAAWS), unless noted otherwise.

2.09 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.10 SHOP FINISHING

- A. Finish work in accordance with AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 12, Polyurethane, Water-based.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.
 - 2. Opaque:
 - a. System - 4, Latex Acrylic, Water-based.
 - b. Color: As selected by Architect.
 - c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install work in accordance with AWMAC/WI (NAAWS) requirements for grade indicated.
 - 1. Install in accordance and comply with WI Certified Seismic Installation Program (CSIP).
 - a. Certified Seismic Casework Installation:
 - 1) All wood or metal frame wall construction shall be constructed with continuous in wall blocking of either 3x6 flat Douglas Fir, 16 ga. x 6 inch wide, or as indicated on the AHJ approved structural drawings, 50 KSI sheet metal provided in accordance with the location requirements included on the cabinet fabricator/installer's shop drawings. Responsibility for blocking installation shall be that of the wall fabricator.
 - 2) All casework installation shall be certified by the Woodwork Institute in accordance with their Certified Seismic Installation Program (CSIP), including:
 - (a) A CSIP Certificate indicating that all of the casework installation fully meets the requirements of the NAAWS and CSIP.

- 3) It is the responsibility of the installer to include within their bid, any and all costs for WI's CSIP certification. Certification is a prerequisite for final acceptance. For further information, please visit www.woodworkinstitute.com
2. Provide a WI Certified Compliance Certificate for installation as specified herein.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
 1. Install plumb, level, true and straight with no distortions. Shim as required using concealed shims. Scribe and cut for accurate fit.
 2. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub-tops within 1/16 inch of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 12 inches on center. Bolt continuous cabinets together. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.
 - a. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
 3. Wall Cabinets: Securely fasten woodwork per Division of the State Architect Standards (as adopted by WI) to solid supporting wall framing material, not plaster, lath, or gypsum board. Anchor, adjust, and align wall cabinets as specified for base cabinets.
 - a. Reinforcement of stud walls to support wall-mounted cabinets specified in appropriate section, but responsibility for accurate location and sizing of reinforcement shall be coordinated with applicable trade.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
 1. Install without distortion so that doors and drawers fit openings and are accurately aligned.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- H. Install finish hardware after all finish work has been completed. Inspect drilling operations for surface splinters or delaminations. Pieces bearing such imperfections will be rejected.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

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

END OF SECTION

SECTION 06 83 16
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass fiber reinforced plastic panels, FRP-1.
- B. Trim.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor.
- C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. FDA Food Code - Chapter 6 - Physical Facilities.
- G. ISO 846 - Plastics - Evaluation of the action of microorganisms.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Crane Composites, Inc: www.cranecomposites.com.
 - 2. Marlite: Standard FRP: www.marlite.com.

3. Nudo: www.nudo.com.
4. Panolam Industries International, Inc; Panolam FRP: www.panolam.com/#sle.
5. Parkland Performance; Plas-Tex PolyWall; www.parklandplastics.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PANEL SYSTEMS

- A. Wall Panels:
 1. Panel Size: 4 by 8 feet.
 2. Panel Thickness: 0.075 inch.
 3. Surface Design: Smooth.
 4. Color: White.
 5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
 4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
 5. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
 6. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.
- B. Trim: Aluminum; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
 - 1. Manufacturer and product identification for each product specified, including R-Value and fire resistance and surface burning characteristics specified herein.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Compliance Certification: Upon completion of installation of building envelope insulation, a card certifying compliance with requirements of California Code of Regulations (CCR) Title 24 for installation of insulation shall be completed, executed and delivered to local building officials, and one copy conspicuously posted at Project site.
- E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Fire Performance Characteristics: Where insulation is used within a fire rated wall assembly, provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, in accordance with methods specified below, by UL or other testing and inspecting agency acceptable to State Fire Marshal.
 - 1. Surface Burning Characteristics: ASTM E84.
 - a. Class A: Maximum flame-spread 0-25 and smoke developed of 0-450.
 - b. Class B: Maximum flame-spread 26-75 and smoke developed of 0-450.
 - c. Class C: Maximum flame-spread 76-200 and smoke developed of 0-450.
 - 2. Fire Resistance Ratings: ASTM E119.
 - 3. Combustibility: ASTM E136.
- B. Comply with Chapter 12-13 Standards for Insulating Materials, California Reference Standards Code (Part 12, Title 24. CCR) as published by Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation.
- C. Comply with California Energy Code:
 - 1. Section 110.8(a): Installed insulating material shall have been certified by the manufacturer to comply with the California Code of Regulations, Title 24, Part 12, Chapters 12-13, Article 3, "Standards for Insulating Material.
 - 2. Section 110.8(c): All Insulating Materials shall be installed in compliance with the flame spread rating and smoke density requirements of CBC Chapters 7 and 26.
 - 3. Section 120.7(b) item 7: The opaque portions of framed demising walls in nonresidential buildings shall be insulated to meet a u-factor of:
 - a. Metal Framed Walls: Not greater than 0.151 (R-6 minimum).
- D. Certificate: As required by the California Building Code (CBC), Title 24, post a certificate containing the building permit number and the insulation manufacturer's name, material identification and R-value and stating that the insulation has been installed in accordance with the plans and specifications.
- E. Performance: Materials shall conform to Section 720, California Building Code.

2.02 APPLICATIONS

- A. Insulation on Inside of Concrete and Masonry Exterior Walls: Glass fiber board.
- B. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- C. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.
- D. Insulation Over Roof Deck: Polyisocyanurate board.

2.03 BATT INSULATION MATERIALS

- A. Dark Surfaced (Black), Flexible Glass-Fiber Blanket Insulation: ASTM C612, Type IA; ASTM C553, Types I, II, and III; or ASTM C665, Type I.
 - 1. One side faced with black glass-fiber mat or black polymer finish.
 - 2. Where indicated, provide black, non-woven fiberglass facing on one side; with flame spread index of 25 or less, and smoke developed of 50 or less, when tested in accordance with ASTM E84.
 - 3. Thickness: 2 inches.
 - 4. NRC: 0.80.
 - 5. Manufacturers:
 - a. CertainTeed Corporation; CertaPro AcoustaBlanket Black: www.certainteed.com/#sle.
 - b. Johns Manville; Insul-SHIELD, Black-Faced (Black Core) Rolls: www.jm.com/#sle.
 - c. Knauf Insulation; Black Wall and Ceiling Liner M: www.knauf.com.
 - d. Owens Corning Corporation; SelectSound Black Acoustic Blanket: www.ocbuildingspec.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Formaldehyde Content: Zero.
 - 5. Exterior Walls:
 - a. Thermal Resistance: R-value of 19.
 - b. Thickness: 5-1/2 inch.
 - 6. Underside of Roof:
 - a. Thermal Resistance: R-value of 30.
 - b. Thickness: 10-1/4 inch.
 - 7. Facing: Aluminum foil, flame spread 25 rated; one side.
 - 8. Exposed Facing in Rooms and Enclosed Spaces: FSK (Foil-Scrim-Kraft), one side.
 - a. Class C per ASTM E84.
 - 9. Exposed Facing in Corridors and Enclosures for Exit Access Stairways and Exit Access Ramps: FSK (Foil-Scrim-Kraft), one side.
 - a. Class B per ASTM E84.
 - 10. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.

- c. Knauf Insulation: www.knauf.com.
 - d. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
- 1. Typical at interior walls.
 - 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 - 3. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
 - c. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Insulation Fasteners: Lengths of unfinished, 13 gauge, 0.072 inch high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.
- B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
 - 1. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 - 2. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 - 3. Finish: Painted matte black at exposed interior acoustical board application.
 - 4. Products:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
 - c. Gemco; Spindle Type.
- C. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- D. Wire Mesh: Galvanized steel, hexagonal wire mesh.
- E. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Adhere 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

- A. Board Installation Over Roof Deck, General:
 - 1. See applicable roofing specification section for specific board installation requirements.
 - 2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
 - 3. Do not apply more insulation than can be covered with roofing on the same day.

3.04 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.06 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 25 00 WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.
- B. Air Barriers: Materials that form a system to stop passage of air through joints between exterior walls and roof and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.
- C. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

1.03 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- H. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- I. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments.

- J. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation.

1.08 FIELD CONDITIONS

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

1.09 WARRANTY

- A. Extended Warranty:
 - 1. Provide written guarantee from waterproofing membrane manufacturer, and furnish joint written warranty to District from waterproofing applicator and Contractor, covering all membranes, and other elements essential to be watertight and will continue to be watertight for a period of at least five years following Acceptance of the Work.
 - 2. Waterproofing membrane manufacturer, and waterproofing applicator and Contractor shall, upon request by District, make all repairs, at no cost to District and without dollar limit, as necessary to correct all waterproofing membrane material or workmanship defects.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
 - 1. Use plastic sheet unless otherwise indicated.
 - 2. Under Portland cement stucco, additionally use two separate layers of building paper, over plastic sheet.
 - 3. Under siding, use one layer of building paper, over plastic sheet.
- B. Air Barrier:
 - 1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

- A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.
 - 1. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of five hours, when tested in accordance with AATCC Test Method 127.
 - 2. Manufacturers:
 - a. Fortifiber Building Systems Group; Super Jumbo Tex 60 Minute: www.fortifiber.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Plastic Sheet: Polymeric-based sheet complying with requirements of ICC-ES AC38 Grade D with 60-minute water-resistance; do not use polyethylene sheet.
 - 1. See Air Barrier Materials.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
 - 3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
 - 4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
 - 5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
 - 6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
 - 7. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.
 - 8. Products:
 - a. Certainteed, Inc.; CertaWrap Weather-Protection Membrane: www.certainteed.com.
 - b. DuPont de Nemours, Inc; Tyvek CommercialWrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: building.dupont.com/#sle.
 - c. Fiberweb, Inc; Typar MetroWrap: www.typar.com/#sle.
 - d. Fortifiber Building Systems Group; WeatherSmart Commercial: www.fortifiber.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
 - 1. Composition: Any material that meets physical requirements of ASTM D1970/D1970M with exceptions indicated.
 - 2. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
 - 3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 - 4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
 - 5. Water Vapor Permeance: 0.067 perm, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
 - 6. Performance: Meet or exceed requirements for ASTM D226/D226M, Type II asphalt-saturated organic felt.
 - 7. Liquid Water Transmission: Passes ASTM D4869/D4869M.
 - 8. Functional Temperature Range: Minus 70 degrees F to 240 degrees F.
 - 9. Manufacturers:
 - a. Carlisle Coatings and Waterproofing, Inc.; CCW-705 TFW: www.carlisle-ccw.com.
 - b. CETCO ; Product Strong Seal SA; www.cetco.com.
 - c. DuPont de Nemours, Inc; DuPont FlexWrap: building.dupont.com/#sle.
 - d. DuPont de Nemours, Inc; DuPont StraightFlash: building.dupont.com/#sle.
 - e. DuPont de Nemours, Inc; DuPont VersaFlange: building.dupont.com/#sle.
 - f. Fortifiber Building Systems Group; FortiFlash: www.fortifiber.com/#sle.
 - g. Fortifiber Building Systems Group; FortiFlash Commercial: www.fortifiber.com/#sle.
 - h. GCP Applied Technologies; Perm-A-Barrier Detail Membrane: gcpat.com/en/solutions/products/perm-a-barrier-air-barrier-system.
 - i. InterWrap, Inc. Mission, BC Canada ; Product Titanium-PSU-30; www.interwrap.com.
 - j. Protecto Wrap; Jiffy Seal 140/60 Air/Vapor Barrier: www.protectowrap.com.
 - k. Soprema, Inc.; Product Lastobond Shield HT MU; www.soprema.us.
 - l. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Mechanical, Electrical or other Penetrations: Provide flashing panels to weatherproof plumbing, HVAC, fire sprinkler and electrical penetrations in exterior walls combined with this section and Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Fasteners with Self-Gasketing Washers: Commercial building wrap manufacturer's recommended pneumatically or hand-applied fasteners with 1 inch diameter, high-density polyethylene cap washers with UV inhibitors.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek Wrap Caps or equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
 - 1. Apply water-resistive barrier complying with:
 - a. Section 1404.2 of the CBC.
- C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
 - 1. Sheathing materials that serve as an air barrier shall comply with California Energy Code Table 140.3-A Section 140.3(a)9 Air Barriers A and B exceptions as listed.
- D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- F. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 - 4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 - 5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - 6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches below bottom of framing and seal to foundation with sealant.
 - 7. Install water-resistive barrier over jamb flashings.
 - 8. Install air barrier and vapor retarder underneath the jamb flashings.

9. Install head flashings under weather barrier.
 10. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
 11. Penetration Sealing: Seal all penetrations through paper from backside using non-staining sealant as specified in Section 07 92 00 Joint Sealers.
- G. Self-Adhered Sheets:
1. At sloped wall segments, all caps, parapets and horizontal projections, surfaces, all locations where products are secured through cement plaster and other locations where waterproof underlayment is indicated; install minimum one layer of self-adhesive sheet. Provide in addition to and integrated with weather barriers as indicated in this section.
 2. Penetration Flashing: Install self-adhering waterproof backing in weatherboard fashion following Plaster Institute recommendations.
 3. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
 4. Lap sheets shingle-fashion to shed water and seal laps air tight.
 5. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
 6. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
 7. At wide joints, provide extra flexible membrane allowing joint movement.
- H. Openings and Penetrations in Exterior Weather Barriers: Comply with Drawing details. As a minimum provide the following:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe subject test-wall areas and installations.

- C. Testing Agency: Engage a qualified third-party testing agency to perform tests and inspections.
- D. Water-Spray Test: Provide water spray quality test of installed weather barrier components in accordance with a modified AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as directed by Architect.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Testing: Water test the complete weather barrier after completion by spraying with hose heavily for 5 minutes. Repair all leaks discovered by testing procedures and repeat test until leak-free performance is achieved.
 - 4. Provide written report to Architect and Project Inspector (IOR).
- E. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.
- F. Do not cover installed weather barriers until required inspections have been completed.
- G. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Flexible flashing.
- B. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.
- C. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM B32 - Standard Specification for Solder Metal.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- G. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- I. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- J. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, (0.0239 inch) thick base metal.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
 - 1. Coping and Cap Flashing:
 - a. Coping and caps of type and profile indicated on Drawings, 20 gage galvanized sheet metal, with integral expansion.
 - 2. Drips at Doors and Windows:
 - a. Provide 20 gage galvanized sheet metal drips at head of all exterior doors and windows where no roof or overhang protection occurs.
 - b. Extend drips 2 inches beyond jambs, unless noted otherwise.
- B. Fabricate cleats of same material as sheet, minimum 4 inches wide, except at continuous strips, interlocking with sheet.
 - 1. Typically use continuous strips.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
 - 1. Typical Seams: Overlapped and sealed seams.
 - 2. Coping Seams: Lock seams, flattened.
 - 3. Seams, Horizontal to Vertical Transitions: Solder joints.
 - 4. Soldered seams: Tin edges to be seamed, form seams, and solder.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 EXTERIOR PENETRATION FLASHING PANELS

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- B. Basis of Design Product: Quickflash Weatherproofing Flashing Panels as manufactured by Quickflash Weatherproofing Products, Inc., www.quickflashproducts.com, or equal.
- C. Coordinate with each trade to provide specific models correctly sized for each individual pipe, duct, conduit, box, or panel penetration in each application as occurs in the building envelope.
- D. Plumbing Flashing Panels:
 - 1. Materials:
 - a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
 - 1) HDPE, Specific Gravity, ASTM D1505: 0.953 g/cm³.
 - 2) HDPE, Tensile Strength at Yield, ASTM D638: 3,100 psi.
 - 3) LDPE, Specific Gravity, ASTM D792: 0.917 g/cm³.
 - 4) LDPE, Tensile Strength at Yield, ASTM D638: 1,300 psi.
 - b. Weatherproof Seal: Thermoplastic elastomer.
 - 1) Hardness, ASTM D2240, Shore A, 10 Seconds: 46.
 - 2) Specific Gravity, ASTM D792: 1.05 g/cm³.
 - 3) Tensile Strength, ASTM D412: 490 psi.
- E. Electrical Flashing Panels:
 - 1. Material: Thermoplastic elastomer.
 - a. Hardness, ASTM D2240, Shore A, 10 Seconds: 93.
 - b. Specific Gravity, ASTM D792: 1.05 g/cm³.
 - c. Tensile Strength, ASTM D412: 1,300 psi.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Miscellaneous Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of the Work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.
- C. Underlayment: Self-adhesive sheet flexible flashing complying with ASTM D1970/D1970M.
 - 1. Adhesives: Type recommended by flexible flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- D. Slip Sheet: Rosin sized building paper.
- E. Primer: Zinc chromate type.

- F. Concealed Sealants: Non-curing butyl sealant.
- G. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
 - 1. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.
- H. Plastic Cement: ASTM D4586/D4586M, Type I.
- I. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.02 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.03 CLEANING AND PREPARATION FOR FIELD PAINTING

- A. Metal Preparation: As sheet metal installation progresses, neutralize excess flux with 5 to 10 percent washing soda solution, and thoroughly rinse.
- B. Repairs: Repair or replace damaged and deformed sheet metal.
- C. Cleaning: Wash down exposed surfaces and remove stains, scrap and debris such that sheet metal is ready to receive field painting and related Work.
 - 1. Wash down exposed surfaces and remove soiling, dust, contamination from steel wool and drilling residue, and other scrap and debris.
 - 2. Scrub surfaces with detergent solution as necessary to remove grease and oil films, handling marks, and stains.

3.04 FIELD PAINTING

- A. Field Painting: Field-paint exposed sheet metal for corrosion resistance and decorative purposes. Field finish painting is specified in Section 09 91 13 - Exterior Painting.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for field inspection requirements.

- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. District-provided field quality control.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
- C. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.
- D. Section 08 80 00 - Glazing: Glazing sealants and accessories.
- E. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- F. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.
- G. Section 23 31 13 - Metal Ducts: Duct sealants.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- C. ASTM C834 - Standard Specification for Latex Sealants.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

- L. SCAQMD 1168 - Adhesive and Sealant Applications.
- M. SWRI (VAL) - SWR Institute Validated Products Directory.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 7. Sample product warranty.
 - 8. Certification by manufacturer indicating that product complies with specification requirements.
 - 9. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Installation Plan: Submit at least four weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- I. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- J. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- K. Installation Log: Submit filled out log for each length or instance of sealant installed.

- L. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- M. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver to manufacturer sufficient samples for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Installation Plan: Include schedule of sealed joints, including the following.
 - 1. Joint width indicated in Contract Documents.
 - 2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
 - 3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgement that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
 - 4. Approximate date of installation, for evaluation of thermal movement influence.
 - 5. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Unique identification of each length or instance of sealant installed.
 - b. Location on project.
 - c. Substrates.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Primer to be used, or indicate as "No primer" used.
 - g. Size and actual backing material used.
 - h. Date of installation.
 - i. Name of installer.

- j. Actual joint width; provide space to indicate maximum and minimum width.
 - k. Actual joint depth to face of backing material at centerline of joint.
 - l. Air temperature.
- F. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 - 1. Identification of testing agency.
 - 2. Name(s) of sealant manufacturers' field representatives who will be observing
 - 3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Test method used.
 - g. Date of installation of field sample to be tested.
 - h. Date of test.
 - i. Copy of test method documents.
 - j. Age of sealant upon date of testing.
 - k. Test results, modeled after the sample form in the test method document.
 - l. Indicate use of photographic record of test.
- G. District will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
 - 1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.
- H. Field Quality Control Plan:
 - 1. Visual inspection of entire length of sealant joints.
 - 2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
 - a. For each different sealant and substrate combination, allow for one test every 12 inches in the first 10 linear feet of joint and one test every 24 inches thereafter.
 - b. If any failures occur in the first 10 linear feet, continue testing at 12 inches intervals at no extra cost to District.
 - 3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
 - a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.

- b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to District.
- 4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- I. Field Adhesion Test Procedures:
 - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
 - 2. Have a copy of the test method document available during tests.
 - 3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
 - 4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 - 5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 - 6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to District.
 - 7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- J. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
 - 1. Record results on Field Quality Control Log.
 - 2. Repair failed portions of joints.
- K. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
 - 1. Sample: At least 18 inches long.
 - 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
 - 3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
 - 4. Record results on Field Quality Control Log.
 - 5. Repair failed portions of joints.
- L. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Adhesives Technology Corporation: www.atcepoxy.com.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dow Corning Corporation: www.dowcorning.com/construction/sle.
 - 4. Fortifiber Building Systems Group: www.fortifiber.com/sle.
 - 5. Hilti, Inc: www.us.hilti.com/#sle.
 - 6. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
 - 7. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
 - 8. Pecora Corporation: www.pecora.com.
 - 9. QUIKRETE Companies: www.quikrete.com/#sle.
 - 10. Sherwin-Williams Company: www.sherwin-williams.com.
 - 11. Sika Corporation: www.usa-sika.com.
 - 12. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 13. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 14. W.R. Meadows, Inc: www.wrmeadows.com/sle.
 - 15. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. Adhesives Technology Corporation: www.atcepoxy.com.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dayton Superior Corporation: www.daytonsuperior.com.
 - 4. Dow Corning Corporation: www.dowcorning.com/construction/sle.
 - 5. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
 - 6. Pecora Corporation: www.pecora.com.
 - 7. QUIKRETE Companies: www.quikrete.com/#sle.
 - 8. Sherwin-Williams Company: www.sherwin-williams.com.

9. Sika Corporation: www.usa-sika.com.
10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
11. W.R. Meadows, Inc: www.wrmeadows.com/sle.
12. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - 1) Unit Masonry.
 - 2) Cement Plastering System.
 - 3) Metal and Composite Panels.
 - 4) Siding.
 - b. Construction joints in cast-in-place concrete
 - c. Joints between door, window, and other frames and adjacent construction.
 - d. Joints between different exposed materials.
 - e. Openings below ledge angles in masonry.
 - f. Control and expansion joints in ceilings and other overhead surfaces.
 - g. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Control and expansion joints on exposed interior surfaces of exterior walls.
 - c. Perimeter joints of exterior openings where indicated.
 - d. Control and expansion joints in tile.
 - e. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
 - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - f. Other joints indicated below.
3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.

- e. Joints between suspended panel ceilings/grid and walls.
- B. Type EP-1 - Exterior Joints: Use non-sag non-staining silicone sealant at storefront and openings, unless otherwise indicated.
- C. Type SM-1 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
- D. Type SM-1 - Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
- E. Type CP-1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
- F. Type IP-1 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
- G. Type IA-1 - Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
- H. Type WP-1 - Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
- I. Type FS-1 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
- J. Type IA-1 - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
- K. Type WFP-1 - Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.
- L. Interior Wet Areas: restrooms and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.
- M. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Colors: As indicated on the drawings. Match adjacent surface.

2.04 NONSAG JOINT SEALANTS

- A. Type NS-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
 - 4. Cure Type: Single-component, neutral moisture curing.
 - 5. Service Temperature Range: Minus 20 to 180 degrees F.
 - 6. Manufacturers:
 - a. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Dow Chemical Company; DOWSIL 791 Silicone Weatherproofing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - c. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.

- d. Momentive Performance Materials, Inc (formerly GE Silicones):
www.momentive.com/sle.
 - e. Pecora Corporation; Pecora 864 NST (Non-Staining Technology):
www.pecora.com/#sle.
 - f. Sika Corporation; Sikasil WS-290: www.usa-sika.com/#sle.
 - g. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
 - h. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
- 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's full range.
 - 3. Cure Type: Single-component, neutral moisture curing
 - 4. Service Temperature Range: Minus 65 to 180 degrees F.
 - 5. Manufacturers:
 - a. Fortifiber Building Systems Group; Moistop Sealant: www.fortifiber.com/#sle.
 - b. Dow Chemical Company; DOWSIL 999-A Building and Glazing Sealant:
consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - c. Pecora Corporation; Pecora 890FTS (Field Tintable Smooth):
www.pecora.com/#sle.
 - d. Momentive Performance Materials, Inc (formerly GE Silicones):
www.momentive.com/sle.
 - e. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant:
www.sherwin-williams.com/#sle.
 - f. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Type FS-1 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
- 1. Color: White.
 - 2. Manufacturers:
 - a. BASF Construction Chemicals-Building Systems; OmniPlus, by Sonneborn Building Products Div.: www.buildingsystems.basf.com.
 - b. Dow Corning Corporation; 786 Silicone Sealant: www.dowcorning.com.
 - c. Momentive Performance Materials, Inc (GE Silicones products); Silpruf SCS 1700 Sanitary: www.momentive.com.
 - d. Pecora Corporation; Pecora 898 NST (Non-Staining Technology):
www.pecora.com/#sle.
 - e. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Type ST-1 - Silyl-Terminated Polyether (STPE) and Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 35 percent, minimum.
 2. Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant: www.sherwin-williams.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Type PS-1 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 2. Color: To be selected by Architect from manufacturer's full range.
 3. Service Temperature Range: Minus 40 to 180 degrees F.
 4. Manufacturers:
 - a. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - b. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
 - c. Sika Corporation; Sikaflex-15 LM: www.usa-sika.com/#sle.
 - d. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Type WP-1 - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
1. Movement Capability: Plus and minus 35 percent, minimum.
 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
- H. Type IA-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: To be selected by Architect from manufacturer's full range.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
3. Manufacturers:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Hilti, Inc; CP 572 Smoke and Acoustical Spray Sealant: www.us.hilti.com/#sle.
 - c. Pecora Corporation: www.pecora.com.
 - d. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - e. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.05 SELF-LEVELING SEALANTS

- A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
 1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Sika Corporation; Sikasil 728SL: www.usa-sika.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type P-1 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - c. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

- C. Type WFP-1 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
 - b. W. R. MEADOWS, Inc; POURTHANE SL: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Self-Leveling Polysulfide Sealant: ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent.
 2. Hardness Range: 30 to 55, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. W.R. Meadows, Inc; Deck-O-Seal (pourable): www.wrmeadows.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.
1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.
 2. Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX ARDIFIX: www.ardexamericas.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
 2. Color: To be selected by Architect from manufacturer's standard colors.
 3. Joint Width, Minimum: 1/8 inch.
 4. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.
 5. Manufacturers:
 - a. Adhesives Technology Corporation; _____: www.atcepoxy.com/#sle.
 - b. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: www.ardexamericas.com/#sle.

- c. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
- d. Nox-Crete Inc; DynaFlex JF-85: www.nox-crete.com/#sle.
- e. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 - 3. Arrange for sealant manufacturer's technical representative to be present during tests.
 - 4. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 5. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 - 6. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. District will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- C. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.
- D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- E. Repair destructive test location damage immediately after evaluation and recording of results.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 06 71
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule of door hardware sets for swinging as indicated on drawings.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

- A. BHMA (CPD) - Certified Products Directory.
- B. BHMA A156.3 - American National Standard for Exit Devices.
- C. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks.
- D. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000.
- E. BHMA A156.18 - American National Standard for Materials and Finishes.
- F. DHI (H&S) - Sequence and Format for the Hardware Schedule.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Comply with submittal requirements as indicated in Section 08 71 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Only manufacturers listed in Door Hardware Schedule or Section 08 71 00 are considered acceptable, unless noted otherwise.
- B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.
- C. Products are listed and certified compliant with specified standards by BHMA (CPD).
- D. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 71 00.
 - 1. GLY - Glynn Johnson, Allegion, PLC.
 - 2. IVE - Ives, Allegion, PLC.
 - 3. KNX/KNO - Knox Company.
 - 4. LCN - LCN Commercial Division, Allegion, PLC.
 - 5. SCE - Schlage Electronic Security, Allegion, PLC
 - 6. SCH/SC - Schlage Lock Company, Allegion, PLC.
 - 7. VON - Von Duprin, Allegion, PLC..

8. ZER - Zero Industries, Inc., Allegion, PLC.
9. TBD - To be determined.
10. BYO/OT - By Others.

2.02 DESCRIPTION

- A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
 1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
 2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.
 3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
 4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 LOCK FUNCTION CODES

- A. Function Codes for Cylindrical Locks: Complying with BHMA A156.5.
- B. Function Codes for Mortise Locks: Complying with BHMA A156.13.
- C. Function Codes for Exit Devices: Complying with BHMA A156.3.

2.04 FINISHES

- A. Finishes: Complying with BHMA A156.18.

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

- A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.
- B. See door schedule in drawings for hardware set assignments.
- C. No hardware shall be ordered until Finished Hardware has been reviewed and approved by Architect's hardware consultant.
- D. Provide Factory order numbers for all products supplied on this project as part of close out documents for District's warranty records.
- E. Any door count quantity shown in the HW set listings is for reference only. Contractor shall verify all door quantities with the Architectural Drawings.
- F. Hardware Sets:

Hardware Group No. SF-02

For use on Door #(s):

105A	117A	118A	118B	119A	130A
131A	138A	140A	155A	156A	

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T OMEA L583-363		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	4" CARPET SEPARATOR	1684D-223		D	ZER

WIDE STILE DOORS REQUIRED

SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. SF-03

For use on Door #(s):

128B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-XP99-L-2SI-16-SNB		643E	VON
2	EA	RIM CYLINDER	20-057 ICX		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH TBWMS		695	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA (IF REQUIRED)		695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30 (IF REQUIRED)		695	LCN
1	EA	BLADE STOP SPACER	4040XP-61 (IF REQUIRED)		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER

ADJUST CLOSER BACK CHECK TO HELP STOP DOOR AT 90 DEGREES
SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. SF-04

For use on Door #(s):

140C 140D

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	224XY		313AN	IVE
2	EA	AUTO FLUSH BOLT	FB31T		613	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	COORDINATOR	COR X FL		315AN	IVE
2	EA	SURFACE CLOSER	4040XPT TBWMS		695	LCN
			(TOP JAMB MOUNTED FOR 180 DEGREE SWING)			
2	EA	TOP JAMB MTG PLATE	4040XPT-18TJ		695	LCN
			(IF REQUIRED)			
2	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
2	EA	DOOR SWEEP	381A		A	ZER
1	EA	ASTRAGAL	383D		D	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL		D	ZER
			DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)			

WIDE STILE DOORS REQUIRED

SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. SF-05

For use on Door #(s):

158B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	4" CARPET SEPARATOR	1684D-223		D	ZER

WIDE STILE DOORS REQUIRED

SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. SF-06

For use on Door #(s):

135B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS		695	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		695	LCN
			(IF REQUIRED)			
1	EA	CUSH SHOE SUPPORT	4040XP-30		695	LCN
			(IF REQUIRED)			
1	EA	BLADE STOP SPACER	4040XP-61		695	LCN
			(IF REQUIRED)			
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL		A	ZER
			DETAIL (INCLUDE 102A-223 IF			
			NONE SHOWN AND ASK FOR			
			CLAIRIFICATION)			

WIDE STILE DOORS REQUIRED

SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. SF-06A

For use on Door #(s):

159A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL		A	ZER
DETAIL (INCLUDE 102A-223 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)						

WIDE STILE DOORS REQUIRED

SEALS BY ALUM STOREFRONT MANUFACTURER

Hardware Group No. 02

For use on Door #(s):

102A 133A 137A 139A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		B643E/ 716	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T OMEA L583-363		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE SEAL	8145SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER

Hardware Group No. 03A

For use on Door #(s):

114A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5 NRP		B643E/ 716	IVE
1	EA	CLASSROOM LOCK	L9070T OMEA		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	ARMOR PLATE	8400 16" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 04

For use on Door #(s):

115A 139D

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1HW 4.5 X 4.5		B643E/ 716	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		BLK	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	SET	GASKETING	326D-S		D	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER

Hardware Group No. 05

For use on Door #(s):

120A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1 4.5 X 4.5 NRP		B643E/ 716	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		BLK	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE SEAL	8145SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER

Hardware Group No. 07A

For use on Door #(s):

107A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1 4.5 X 4.5		B643E/ 716	IVE
1	EA	PRIVACY LOCK	L9040 OMEA L583-363 L283-722		643e	SCH
1	EA	SURFACE CLOSER	4041 DEL TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP	FS436 OR FS438 AS REQ.		613	IVE
1	EA	DOUBLE SEAL	8145SBK PSA		BK	ZER

RESTROOM SIGNAGE BY OTHERS

Hardware Group No. 15

For use on Door #(s):

101B 103B 153B 154B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	DOOR PULL	VR910 NL		630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	RAIN DRIP	142D		D	ZER
			(OMIT WHERE OVERHANG OCCURS)			
1	SET	GASKETING	429D-S		D	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 103D-223 IF NONE SHOWN)		D	ZER
2	EA	VIEWER	698		605	IVE
			(INSTALL VIEWERS AT 43" & 60" A.F.F.)			

ADJUST CLOSER BACK CHECK TO HELP STOP DOOR AT 90 DEGREES

Hardware Group No. 21A

For use on Door #(s):

151A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	DBL CYL DEAD LOCK	L9462T L283-711		643E	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	PUSH PLATE	8200 8" X 16" CFC		613	IVE
1	EA	PULL PLATE	8302 10" 4" X 16" CFT F		613	IVE
1	EA	SURFACE CLOSER	4041 DEL TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP	FS18S		BLK	IVE
3	EA	DOUBLE FIN GASKETING	8042SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 103D-223 IF NONE SHOWN)		D	ZER

RESTROOM SIGNAGE BY OTHERS

Hardware Group No. 21B

For use on Door #(s):

106A 150A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		313AN	IVE
1	EA	DBL CYL DEAD LOCK	L9462T L283-711		643E	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	PUSH PLATE	8200 8" X 16" CFC		613	IVE
1	EA	PULL PLATE	8302 10" 4" X 16" CFT F		613	IVE
1	EA	SURFACE CLOSER	4041 DEL EDA TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP	FS18S		BLK	IVE
3	EA	DOUBLE FIN GASKETING	8042SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 103D-223 IF NONE SHOWN)		D	ZER

RESTROOM SIGNAGE BY OTHERS

Hardware Group No. 31A

For use on Door #(s):

104A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		B643E/ 716	IVE
1	EA	CLASSROOM LOCK	L9070T OMEA		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE SEAL	8145SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER

Hardware Group No. 34

For use on Door #(s):

109A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1 4.5 X 4.5		B643E/ 716	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		BLK	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE SEAL	8145SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER

Hardware Group No. 35

For use on Door #(s):

155C 163A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1 4.5 X 4.5		B643E/ 716	IVE
1	EA	CLASSROOM SECURITY	L9071T OMEA L283-711		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		BLK	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE FIN GASKETING	8042SBK PSA		BK	ZER

Hardware Group No. EX-SF-01

For use on Door #(s):

135A 158A 160A 161A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX 36-083 (@ MULLION)		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX 36-083 (@ KEY SWITCH)		643e	SCH
3	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH

EXISTING DOOR, FRAME & HARDWARE TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

REUSE BALANCE OF EXISTING HARDWARE

Hardware Group No. EXST-01

For use on Door #(s):

101A	103A	103C	112A	124A	125A
125B	126B	127A	128A	143A	147C
148C	149A	153A	154A	157A	

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	3CB1HW 4.5 X 4.5 NRP (FIELD VERIFY SIZE)		B643E/ 716	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-XP99-L-2SI-16-SNB		643E	VON
2	EA	RIM CYLINDER	20-057 ICX		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	FLOOR STOP/HOLDER	FS40 SERIES		613	IVE
1	EA	DOUBLE FIN GASKETING	8042SBK PSA		BK	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER
1	EA	EDGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
1	EA	STRIKE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH

EXISTING DOOR AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

Hardware Group No. EXST-02

For use on Door #(s):

108A	123A	165A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	REUSE EXISTING			TBD
1	EA	STOREROOM LOCK	L9080T OMEA		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI

EXISTING DOOR, FRAME & HARDWARE TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE.

Hardware Group No. EXST-03

For use on Door #(s):

121A 122A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	REUSE EXISTING			TBD
1	EA	CLASSROOM DEAD LOCK	L9463T XB11-720		643E	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4041 DEL SCUSH TBWMS		695	LCN
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI

EXISTING DOOR, FRAME & HARDWARE TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE.

Hardware Group No. EXST-04

For use on Door #(s):

143B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		B643E/ 716	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH TBWMS		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	SET	GASKETING	429D-S		D	ZER
1	EA	DOOR SWEEP	381A		A	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL DETAIL (INCLUDE 545D-V3-226 IF NONE SHOWN AND ASK FOR CLAIRIFICATION)		D	ZER
1	EA	EDGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
1	EA	STRIKE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH

EXISTING DOOR AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

Hardware Group No. EXST-04A-AL

For use on Door #(s):

148A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	054XY		313AN	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH TBWMS		695	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA (IF REQUIRED)		695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30 (IF REQUIRED)		695	LCN
1	EA	BLADE STOP SPACER	4040XP-61 (IF REQUIRED)		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	REUSE EXISTING		UNF	EXI
1	EA	EDGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
4	EA	HINGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
1	EA	STRIKE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH

EXISTING DOOR AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

Hardware Group No. EXST-04-AL

For use on Door #(s):

147A 147B 148B 157B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	054XY		313AN	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS		695	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA (IF REQUIRED)		695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30 (IF REQUIRED)		695	LCN
1	EA	BLADE STOP SPACER	4040XP-61 (IF REQUIRED)		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	REUSE EXISTING		UNF	EXI
1	EA	EDGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
4	EA	HINGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
1	EA	STRIKE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH

EXISTING DOOR AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

Hardware Group No. EXST-05

For use on Door #(s):

145A 162A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	REUSE EXISTING			TBD
1	EA	STOREROOM LOCK	L9080T OMEA		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP HEDA TBWMS		695	LCN
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI

EXISTING DOOR, FRAME & HARDWARE TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE.

Hardware Group No. EXST-06

For use on Door #(s):

146A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	REUSE EXISTING			TBD
1	EA	STOREROOM LOCK	L9080T OMEA		643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		695	LCN
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI

EXISTING DOOR, FRAME & HARDWARE TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE.

Hardware Group No. EXST-07-AL

For use on Door #(s):

149B

Provide each UEP door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	054XY		313AN	IVE
1	SET	CONST LATCHING BOLT	FB51/61 AS REQ'D		613	IVE
1	EA	DUST PROOF STRIKE	DP2		613	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB		695	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
1	EA	MORTISE CYLINDER	20-061 ICX 36-083		643e	SCH
			(@ MULLION)			
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083		643e	SCH
			(@ DOGGING)			
3	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS		695	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		695	LCN
			(IF REQUIRED)			
1	EA	CUSH SHOE SUPPORT	4040XP-30		695	LCN
			(IF REQUIRED)			
1	EA	BLADE STOP SPACER	4040XP-61		695	LCN
			(IF REQUIRED)			
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		613	IVE
1	EA	DOOR STOP	REUSE EXISTING		UNF	EXI
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
2	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	AS REQUIRED BY THRESHOLD SILL		D	ZER
			DETAIL (INCLUDE 103D-223 IF			
			NONE SHOWN)			
1	EA	EDGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
4	EA	HINGE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH
1	EA	STRIKE FILLER PLATE	VERIFY SIZE IN FIELD		600	SBH

EXISTING DOOR AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & DOOR AS REQUIRED FOR NEW HARDWARE

Hardware Group No. EXST-G-01

For use on Door #(s):

G2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
8	EA	HINGE	REUSE EXISTING			TBD
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-EO-WH-SNB		643E	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-WH-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
3	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
2	EA	GATE BOX	K-BXED SERIES		600	KEE
1	EA	DOOR PULL	VR910 DT		630	IVE
1	EA	DOOR PULL	VR910 NL		630	IVE
2	EA	GATE CLOSER	4040XPT BUMP SRI X ST3592 AS REQ'D		689	LCN

EXISTING GATE AND FRAME TO REMAIN.

MODIFY EXISTING FRAME & GATE AS REQUIRED FOR NEW HARDWARE

Hardware Group No. G-01

For use on Door #(s):

G1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
8	EA	HINGE/PIVOTS	BY GATE SUPPLIER			B/O
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-EO-WH-SNB		643E	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-XP99-NL-OP-110MD-WH-SNB		643E	VON
1	EA	RIM CYLINDER	20-057 ICX		643e	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083 (@ DOGGING)		643e	SCH
3	EA	PRIMUS CORE	20-740-XP EV29 T		606	SCH
2	EA	GATE BOX	K-BXED SERIES		600	KEE
1	EA	DOOR PULL	VR910 DT		630	IVE
1	EA	DOOR PULL	VR910 NL		630	IVE
2	EA	GATE CLOSER	4040XPT BUMP SRI X ST3592 AS REQ'D		689	LCN

BALANCE OF HARDWARE BY GATE MANUFACTURER / SUPPLIER

MISCELLANIOUS HARDWARE REQUIRED:

Provide the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>		<u>FINISH</u>	<u>MFR</u>
1	EA	EXTRA PRIMUS CORES	20-740 XP EV29 T		606	SCH
3	EA	CONTROL	KEYS			SCH
3	EA	EMERGENCY	KEYS			SCH
12	EA	CONST. MASTER	KEYS			SCH
3	EA	CONST. CONTROL	KEYS			SCH
4	EA	"0" CUT CHANGE KEYS	PER CYLINDER OR CORE			SCH
5	EA	GRANDMASTER KEYS	PER GRANDMASTER GROUP			SCH
50	EA	EXTRA KEYBLANKS	PER KEYWAY			SCH
5	EA	MASTER KEYS	PER MASTER GROUP			SCH
1	SET	SPECIAL TOOLS	DRIVERS, WRENCHES, ETC			
1	EA	BINDER	INST/MAINT/ADJUSTMENT INFO EA ITEM			
1	EA	BINDER	CATALOG CUTS AND HARDWARE SCHEDULE FOR JOB			
1	EA	LIST OF ORIGINAL	FACTORY ORDER NUMBERS FOR WARRANTY VALIDATION			

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 91 13 - Exterior Painting: Field painting.
- D. Section 09 91 23 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

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

1.04 REFERENCE STANDARDS

- A. 12-7-4 CA Ref Stds - California Referenced Standards Code Chapter 12-7-4 Fire Resistive Standards.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- E. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- F. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- G. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- H. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

1. Use 2016a as indicated in 2019 CBC Referenced Standards.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 1. Use 2015 as indicated in 2019 CBC Referenced Standards.
- J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- L. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 1. Use 2004(2012) as indicated in 2019 CBC Referenced Standards.
- M. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- N. ITS (DIR) - Directory of Listed Products.
- O. NAAMM HMMA 820 TN03 - Guidelines for Glazing of Hollow Metal Transoms, Sidelights and Windows.
- P. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- Q. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- R. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.
- S. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- U. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
 1. Use 2017 as indicated in 2019 CBC Referenced Standards.
- W. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- X. UL (DIR) - Online Certifications Directory.
- Y. UL 10B - Standard for Fire Tests of Door Assemblies.
 1. Use 2008 (Revised 2015) as indicated in 2019 CBC Referenced Standards.
- Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
 1. Use 2009 (Revised 2015) as indicated in 2019 CBC Referenced Standards.
- AA. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
 1. Use 2001 (Revised 2015) as indicated in 2019 CBC Referenced Standards.
 2. Use 2001 as indicated in 2019 CBC Referenced Standards.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
 - 1. Show fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 2. Provide schedule of doors and frames using same reference numbers for details and openings as those indicated on Drawings.
 - 3. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Provide packaging such as cardboard, or other containers to protect surfaces of hollow metal doors. Strap welded frames together in pairs with head of one unit inverted or provide temporary spreaders fastened to the bottom of each frame.
- B. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 1. Store doors and frames on platforms under cover.
 - 2. Store doors and frames in dry storage spaces, with adequate ventilation, free from dust, and which permits easy access for inspection and handling.
 - 3. Avoid using nonvented plastic or canvas shelters that create a humidity chamber.
 - 4. If the wrapper on the door becomes wet, remove the wrapper.

- C. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Fire-Rated Door Assemblies: Meet the requirements of the California Building Code (CBC), Title 24, Part 2, Chapter 7 - Fire Resistance Rated Construction for the fire resistive ratings indicated, and which are labeled by Underwriter's Laboratories, Factory Mutual, or other testing agency acceptable to the State Fire Marshal.
 - 1. Fire-rated door and frame construction: Conform to NFPA 252, applicable CBC Standard 12-7-4 CA Ref Stds and requirements of Factory Mutual System (FM). Labels on fire-rated doors and frames shall identify FM listing approval. Comply with UL 10B.
 - 2. Fire-rated door and frame installation: NFPA 80 - Fire Door Installation and applicable CBC Standards for fire rated class indicated.
 - 3. Fire-rated doors, intumescent seals: UL 10C compliant. If intumescent seals are required for the fire labeled assembly, furnish flush with door edge type seals or kerfed in frame type seals. Surface applied adhesive seals will not be accepted. Coordinate frame fabrication to allow use of kerfed in frame type seal options.
 - 4. Temperature rise rating: At exit stairwell enclosures, exit passageways, and horizontal exits, provide doors which are labeled for a maximum transmitted temperature end point not to exceed 450 degrees above ambient at the end of 30 minutes of fire exposure.
 - 5. Oversize fire-rated door assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to the State Fire Marshal that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 6. Where fire resistive doors are indicated to be equipped with louvers, provide fusible link type louvers acceptable to the testing agency labeling the fire door and frame assembly.
 - a. Exception: Louvers are not to be used in "S" rated door assemblies. CBC Section 710.5.2.1 and 716.2.2.1.1.
 - 7. All exit/access doorways and other doors opening into a fire rated corridor shall be protected by tight-fitting smoke and draft control assemblies having a fire rating of not less than 20 minutes when tested in accordance with CBC Standards and shall be labeled accordingly per CBC section 716.2.2.1.

2.02 MANUFACTURERS

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

2.03 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ADAAG 2010 and CBC Chapter 11B.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Beveled, both sides.
5. Typical Door Face Sheets: Flush. Smooth.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.04 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
2. Core Material: Polystyrene, 1 lbs/cu ft minimum density.
3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.

- a. Doors with no glazing or less than 50 percent glazed shall comply with the required U-factor not greater than the applicable value (0.70) in Subchapter Table 140.3-B, C, or D. California Energy Code Section 140.3 (a) 7.
- 4. Door Thickness: 1-3/4 inches, nominal.
- 5. Weatherstripping: Refer to Section 08 71 00.
 - a. Maximum Air Leakage, ASTM E283: 0.30cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity). California Energy Code Section 110.6(a) 1.
- C. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches, nominal.
- D. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
 - c. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - 1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - 2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
 - 3) Label: Include the "S" label on fire-rating label of door.
 - 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 - a. Fabricate to the requirements of NFPA 252 for the hourly rates indicated.
 - 4. Door Thickness: 1-3/4 inches, nominal.

2.05 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Fully welded.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 - 3. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
- E. Door Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- F. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- G. Frames for Interior Glazing, Borrowed Lights, and Sidelights: Construction and face dimensions to match door frames, and as indicated on drawings.
 - 1. Full formed, concealed fastenings, welded corners, fabricated as for door frames.
 - 2. Shapes as detailed and scheduled on Drawings.
 - 3. Provide single rabbet frames at all Interior Glazing, Borrowed Lights, Sidelights, and Exterior Windows.
 - 4. Cold rolled steel with anchors same as for door frames for respective wall condition.
 - a. Exception:
 - 1) Jamb anchors located within 6 inches of head and sill plus spaced not more than 24 inches on center.
 - 2) Head and sill anchors located within 6 inches of jambs plus spaced not more than 24 inches on center.
- H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.06 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
 - 1. Exterior Steel Doors and Door Frames: Comply with requirements for primer for finish coats.
 - 2. Interior Steel Doors and Rolled Steel Door Frames: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- D. Field Applied Finish Painting: As specified in:
 - 1. Section 09 91 13 - Exterior Painting.
 - 2. Section 09 91 23 - Interior Painting.

2.07 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
- B. Glazing: As specified in Section 08 80 00, factory installed.
 - 1. Glazed Openings: Comply with CBC Section 716.3.2.1.2 and Chapter 24.
 - a. Vision Panel: Factory installed.
 - 1) Application: Provide at all new classroom, office, corridor and other teacher and staff occupied spaces.
 - 2) Size (WxH): 6 by 37 inches, unless indicated otherwise on Drawings.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
 - 1. Glazing Stops: Channel glazing stops, completely fit ready for removal and glazing at site.
 - 2. Place on exterior side with tamper proof screws.
- D. Astragals for Double Doors: Specified in Section 08 71 00.
- E. Supports and Anchors: Fabricate of not less than 16 gage sheet steel; galvanized where used with galvanized frames or at exterior, damp or wet locations.
 - 1. Anchors: Provide in accordance with ANSI/SDI A250.11.
 - a. Anchors at fire rated frames shall also conform to UL 10B.
 - b. Provide one floor anchor and the number of wall anchors listed below welded into each jamb member.
 - 1) Number of anchors at:
 - (a) Concrete or Masonry: Typically 3, and 4 for doors over 7'-0" high.
 - (b) Steel Stud Partitions: Typically 4, and 5 for doors over 7'-0" high.
 - c. Wall anchors shall be of type indicated for the specific wall condition and of same material specified for frames.
 - d. Provide head anchors welded into head member as recommended by the frame manufacturer.
 - e. All anchors shall be 16 gage minimum for galvanized frames and 16 gage minimum for cold or hot rolled steel frames.
 - f. Provide "Z" spacer type anchors for all wood studs.
 - 2. Punch and dimple jambs within 6 inches of bottom for attachment to concrete stem walls where occur.
- F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

1. Omit silencers where head and jamb bulb-type weatherstripping or sound seals are to be installed and omit where in violation of fire rating. Silencers are specified in Section 08 71 00 - Door Hardware.
- G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- H. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A153/A153M, Class C or D as applicable.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. In addition, install fire rated units in accordance with NFPA 80 and their listing.
 1. Provide clearances as specified in NFPA 80, NFPA 105, and as required by California Building Code (CBC).
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 71 00.
 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E. Coordinate installation of electrical connections to electrical hardware items.
- F. Welded Steel Frames Installation:
 1. Install frame solid in the wall, plumb and square, with proper opening width and height.
 - a. Dry-pack void when frame set in place.
 2. Fasten clip angles to floor construction and brace frames so as to retain their position and clearance during construction of adjacent Work. Attach structural overhead bracing securely to structure above, as required.
 3. Install anchors for connection to concrete/masonry at each jamb (minimum 3 per jamb).
 4. Install anchors for stud partitions on hinge jamb immediately above each hinge reinforcing plate and below the top hinge reinforcement (minimum 4 per jamb) and locate anchors directly opposite on the strike jamb.
 5. Comply with requirements for fire-rated assembly, including filling frame with solid portland cement grout or firestopping material, as detailed.

- G. Doors Installation, General: Hang doors and adjust for proper clearances and operation. Refer to Section 08 71 00 - Door Hardware for hardware requirements.
- H. For waterproofing of hollow metal window frames, follow NAAMM HMMA 820 TN03.
- I. Touch up damaged factory finishes.

3.04 REPAIRS:

- A. Make repairs only if permitted by Architect. Otherwise, replace damaged components.
- B. Fill surface depressions with metallic paste filler, allow to thoroughly cure, sand flush, and smooth for an invisible appearance with adjacent metal surfaces.
- C. Sand smooth all rusted areas.
- D. Repair galvanized surfaces with specified repair compound.
- E. Apply touch-up paint using air drying primer compatible with shop-applied finish.

3.05 TOLERANCES

- A. Flush Steel Door Installation Tolerances: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8.
- B. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- C. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.06 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.07 CLEANING AND PROTECTION

- A. Prime Coat Touch-up: Immediately after installation, sand smooth all corroded (rusted), damaged and deteriorated areas of prime coat and apply touch-up coat of compatible air-drying primer.
- B. Protection: Protect installed frames and doors from damage.
 - 1. Provide protective coverings and other devices as necessary, in conformance to requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 2. Remove protective devices from prefinished components for Substantial Completion review.
- C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.
- D. Cleaning: Clean doors and frames of surface contaminants detrimental to proper application of field-applied finishes.

3.08 SCHEDULE - SEE DRAWINGS

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall and ceiling mounted access units.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Openings in partitions.
- B. Section 09 21 16 - Gypsum Board Assemblies: Openings in ceilings.
- C. Section 09 30 00 - Tiling: Tile finishes on and around openings.
- D. Section 09 91 13 - Exterior Painting: Field paint finish.
- E. Section 09 91 23 - Interior Painting: Field paint finish.
- F. Divisions 11: Miscellaneous components requiring access.
- G. Divisions 21, 22, 23, 26, 27, and 28: Mechanical and Electrical components requiring access.
 - 1. Access doors in ductwork.

1.03 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
 - 1. If other than specified products by specified manufacturer, submit product data for each type of access door to be used. Include schedule of access door types, sizes and locations.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
 - 1. For access doors other than shown on Drawings, submit marked floor plan giving locations of all access doors. Submit shop drawing for Architect's review before laying out utility services which require access doors.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.
- E. Manufacturer's Qualification Statement.
- F. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Regulation Requirements: Fire rated access doors shall conform to California Building Code (CBC) Title 24, Part 2, Chapter 7. Panels shall bear the label of Underwriters Laboratories or other testing agency acceptable to the State Fire Marshal.
- C. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly for rating shown, with flush door, frame, hinge, and latch from manufacturer listed in UL - Building Materials Directory. Provide UL label on each fire-rated access door.
- D. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- E. Coordination: Furnish inserts and anchoring devices for building into adjoining Work for installation of access doors.

1.07 PROJECT CONDITIONS

- A. Verification: Obtain specific locations and sizes for required access doors for Work specified in Plumbing, Mechanical, Electrical or other Sections, for access to concealed equipment, and indicate on submitted schedule.
- B. Special-Size Access Doors: Sizes up to 20-inches by 30-inches used where necessary or as indicated. Indicate special size access doors on submitted schedule.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS

- A. Access Door Materials and Fabrication, General: Provide each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
 - 1. If size is not indicated, provide size as directed to adequately access concealed operable mechanisms.
- B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.
 - 1. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

2.02 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 - 3. Size: 12 by 12 inches, nominal minimum.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- B. Wall-Mounted Units in Wet Areas:
1. Location: As indicated on drawings.
 2. Panel Material: Stainless steel, Type 304.
 3. Size: 12 by 12 inches, nominal minimum.
 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- C. Fire-Rated Wall-Mounted Units:
1. Location: As indicated on drawings.
 2. Wall Fire-Rating: As indicated on drawings.
 3. Panel Material: Steel.
 4. Size: 12 by 12 inches, nominal minimum.
 5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.
- D. Ceiling-Mounted Units:
1. Panel Material: Aluminum extrusion with gypsum board inlay.
 2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 3. Size - Other Ceilings: 12 inch by 12 inch, nominal minum.
 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 5. Ceiling Doors and Panels: Open with allen wrench - no keys.
 6. Ceiling Doors and Panels: Include a retention spring or bar to keep door from falling open rapidly.

2.03 WALL AND CEILING MOUNTED ACCESS UNITS

- A. Manufacturers:
1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
 2. ACUDOR Products Inc: www.acudor.com/#sle.
 3. Babcock-Davis: www.babcockdavis.com.
 4. Cendrex, Inc: www.cendrex.com/#sle.
 5. Larsen's Manufacturing Co.: www.larsensmfg.com.
 6. Karp Associates, Inc: www.karpinc.com.

7. Milcor, Inc: www.milcorinc.com.
 8. Nystrom, Inc: www.nystrom.com.
 9. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Style: As indicated on drawings.
 2. Door Style: Single thickness with rolled or turned in edges.
 3. Frames: 16 gauge, 0.0598 inch, minimum thickness.
 4. Heavy Duty Frames: 14 gauge, 0.0747 inch, minimum thickness.
 5. Heavy Duty Single Steel Sheet Door Panels: 14 gauge, 0.0747 inch, minimum thickness.
 6. Door Panels to Receive Wall/Ceiling Finish: Surface recessed 5/8 inch back from wall face.
 - a. For recess-mounted access doors, provide access sleeves for each locking device.
 - b. Provide plastic grommets for installation in holes cut through finish.
 - c. Provide recess-mounted doors for concealed installation in:
 - 1) Acoustic tile ceiling systems, where indicated.
 - 2) Acoustical tile-finished gypsum board ceilings, where indicated.
 - 3) Gypsum board walls, where indicated.
 - 4) Ceramic tile walls, where indicated.
 7. Insulation: Non-combustible mineral wool or glass fiber.
- C. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
1. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
 2. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
 3. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
 4. Door/Panel Size: As indicated on the drawings.
 5. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - c. Latch/Lock: Screw driver slot for quarter turn cam latch.
 - d. Gasketing: Extruded neoprene, around perimeter of door panel.
- D. Provide recess-mounted doors and frames with expanded metal lath for concealed installation in plaster.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions, in compliance with requirements of listing authority..
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Provide for correct termination of adjoining finish materials.
- D. Position units to provide convenient access to concealed equipment when necessary.

3.04 ADJUST AND CLEAN

- A. Adjust access doors and hardware after installation for proper and smooth operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.
- C. Remove protective coverings and clean stainless steel access doors during cleaning for Substantial Completion Review.

3.05 SCHEDULES

- A. Access Door Locations:
 - 1. Provide access doors where indicated on Architectural, Mechanical, Plumbing and Electrical Drawings.
 - 2. Access doors indicated and required for Mechanical, Plumbing and Electrical Work shall be of a type matching those specified in this Section.
 - 3. Provide access doors as required to service building systems and as required by governing authorities, although not shown on Drawings.
 - a. Provide at smoke or fire detector in attic spaces. Size to allow for access and testing.
 - 4. Locate access doors, where practical, in building service areas and not in public or guest view.
 - 5. Submit proposed locations for access doors, not indicated on Drawings, to Architect for review prior to rough-in.
- B. Non-Fire Rated Door and Frame Units in Walls:
 - 1. In Gypsum Board on Studs:

- a. For service and utility locations, primer paint finish, Model DSC-214M manufactured by Karp.
 - b. For food service, toilet and damp locations, stainless steel, Model DSC-214M manufactured by Karp.
 - c. For Administration, Multi-Purpose and similar areas accessible by general public, recessed face for field-applied and finished plaster on door face, Model RDW manufactured by Karp.
 - d. For toilets and locations accessible by general public with ceramic tile wall finish, flush-mounted with face of tile, stainless steel, Model DSB-214M manufactured by Karp.
- C. Non-Fire Rated Door and Frame Units in Ceilings:
- 1. In Gypsum Board on Metal Furring:
 - a. For service and utility locations, primer paint finish, Model DSC-214M manufactured by Karp.
 - b. For food service, toilet and damp locations, stainless steel, Model DSC-214M manufactured by Karp.
 - c. For Administration, Multi-Purpose and similar areas accessible by general public, recessed face for field-applied and finished plaster on door face, Model RDW manufactured by Karp.
- D. Fire-Rated Access Doors: Access doors in time-rated fire-resistive walls, partitions and ceilings shall carry same rating as the wall, partition or ceiling.
- E. Fire Rated Door and Frame Units in Walls:
- 1. In Gypsum Board on Studs:
 - a. 1-1/2 hour B label fire rating.
 - b. For public areas, service and utility locations, primer paint finish, surface mounted, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch, Model KPR-150FR manufactured by Karp.
 - c. For Food Service, Toilet and other damp locations with ceramic tile finish, stainless steel finish, surface mounted, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch, Model KPR-150FR manufactured by Karp.
- F. Fire Rated Door and Frame Units in Ceilings:
- 1. In Gypsum Board on Metal Furring:
 - a. For typical dry locations, surface mounted, primer paint finish, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch, Model KRP-150FR manufactured by Karp.
 - b. For Food Service, Toilet and other damp locations, stainless steel finish, surface mounted, filled with 2-inch thick fire-rated insulation, with automatic closer, self-latching bolt-type latch, Model KPR-150FR manufactured by Karp.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass. ALUM-1
- B. Infill panels of glass.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Steel attachment devices.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
- D. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Structural and Energy design of the system has already been used as a basis of approval by Division of the State Architect and other agencies. If a substitution is proposed, then the Contractor is responsible for the re-approval of the documents in a timely manner within the original project schedule, along with all professional and agency fees related to this substitution. See Section 01 60 00 - Product Requirements.
- C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

1. Include construction details and fabrication methods, profiles and dimensions of individual components, data on hardware, accessories, and finishes.
2. Energy Model Submissions
 - a. Provide a copy of the project ENV-1 form.
 - b. Provide evidence that the proposed products can meet or exceed the energy values listed on the ENV-1 form. Preferred method is an NFRC site certificate, but a simulation report by an independent NFRC certified simulator will be considered. *AAMA test reports and or simulations will not be accepted as they are not allowed under the current code.*
 - c. Provide a statement of who will be the “responsible party” in issuing the NFRC site certificates.
- D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 1. Complete, indicating elevation views of all units, attachments to surrounding construction of Project, type of glazing, and all door hardware and weatherstripping. All Shop Drawings shall be prepared by manufacturer and shall include manufacturer's logo.
- E. Samples: Submit two samples 2 x 3 inches in size illustrating finished aluminum surface, glass, glazing materials.
- F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- G. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- H. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- J. Manufacturer's Qualification Statement.
- K. Installer's Qualification Statement.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in District's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
- C. Single-Source Responsibility: All entrances and storefront framing and doors, including finish, shall be the product of one manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.

- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
 - 1. Store storefront sections out of contact with the ground and under a weather tight covering. Do not cover storefront sections with polyethylene film or similar coverings that will create a humidity chamber.
 - 2. Protect surfaces during shipping and handling to prevent scratching, gouging or other damage to the finish.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. All doors shall carry manufacturer's lifetime warranty on door corner construction, provided in writing.
- C. Correct defective Work within a five year period after Date of Substantial Completion.
- D. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- E. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Arcadia, Inc.
- B. Other Acceptable - Aluminum-Framed Storefronts Manufacturers:
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.
 - a. For any product not identified as "Basis of Design", submit information as specified for substitutions.
 - b. Substitution may or may not be accepted after Architect and District review with complete evaluation for content and schedule impact.
 - c. Substitutions shall include all costs for redesign with consequential changes by other trades along with the Architect and related approvals by governing agencies.
 - 1) Revision to shop drawings illustrating changes is not considered adequate for DSA review and approval.
 - d. Substitutions may be acceptable, based on Architect's review and approval, for submittal to DSA.
 - 1) If substituted manufacturer cannot reproduce design and DSA approval in a timely manner, then they shall be subject to a time and material back charge for any delays in the project.
 - 2) Architect approval is required prior to DSA submittal and DSA approval is required prior to installation.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Center-Set Style:

1. Basis of Design: Arcadia Corp; Center Glazed System A400 Series - Non-Them - Shear Block Inside Set: www.arcadiainc.com.
2. Vertical Mullion Dimensions: 1-3/4 inches wide by 4 inches deep.

2.03 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 1. Glazing Rabbet: For 1/4 inch monolithic glazing.
 2. Finish: Class I color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
 10. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

2.04 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
 3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: As specified in Section 08 80 00.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- E. Concealed Flashings: Galvanized steel, 26 gauge, 0.0179 inch minimum base metal thickness.
- F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- G. Sealant for Setting Thresholds: Non-curing butyl type.
- H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- I. Glazing Accessories: As specified in Section 08 80 00.
- J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.
- K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

- A. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
 - 1. Anchoring: Firmly anchor framing using fasteners as recommended by manufacturer, sized to suit loads and type suitable for substrate, to positively attach members for long life under hard use.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- F. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Set thresholds in bed of sealant and secure.

- H. Install glass in accordance with Section 08 80 00, using gasket glazing method.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

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

3.04 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 40 00 - Quality Requirements, for general testing and inspection requirements.
- C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

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

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Lock cylinders for doors that hardware is specified in other sections.
- D. Thresholds.
- E. Weatherstripping and gasketing.
- F. Replacement hardware for existing doors.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.
- B. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.
- C. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.
- D. Section 08 11 13 - Hollow Metal Doors and Frames.
- E. Section 08 43 13 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
- F. Section 10 14 00 - Signage: Additional signage requirements.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. BHMA (CPD) - Certified Products Directory.
- C. BHMA A156.1 - American National Standard for Butts and Hinges.
- D. BHMA A156.3 - American National Standard for Exit Devices.
- E. BHMA A156.4 - American National Standard for Door Controls - Closers.
- F. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks.
- G. BHMA A156.6 - American National Standard for Architectural Door Trim.
- H. BHMA A156.7 - American National Standard for Template Hinge Dimensions.
- I. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000.
- J. BHMA A156.16 - American National Standard for Auxiliary Hardware.
- K. BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots.
- L. BHMA A156.20 - American National Standard for Strap and Tee Hinges, and Hasps.
- M. BHMA A156.21 - American National Standard for Thresholds.
- N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor.
- O. BHMA A156.26 - American National Standard for Continuous Hinges.

- P. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems.
- Q. BHMA A156.36 - American National Standard for Auxiliary Locks.
- R. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- S. DHI (H&S) - Sequence and Format for the Hardware Schedule.
- T. DHI (KSN) - Keying Systems and Nomenclature.
- U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
- V. ITS (DIR) - Directory of Listed Products.
- W. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- X. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- Y. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- Z. UL (DIR) - Online Certifications Directory.
- AA. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- AB. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Contractor.
 - b. District and relevant staff.
 - c. Architect.
 - d. Installer's Architectural Hardware Consultant (AHC).
 - e. Hardware Installer.
 - 3. Agenda:

- a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
- 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - c. Schematic diagram of preliminary key system.
- 5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.
 - a. Furnish District's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the District.
- 6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
 - 1. Submittals prepared without thorough jobsite visit by qualified hardware expert may be rejected as non-compliant.
- C. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- D. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - a. Submit in vertical format, refer to Section 08 06 71.
 - 3. List groups and suffixes in proper sequence.
 - 4. Provide complete description for each door listed.
 - 5. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 6. Include account of abbreviations and symbols used in schedule.
- E. Samples for Verification:

1. Submit minimum size of 2 by 4 inch for sheet samples, and minimum length of 4 inch for other products.
 2. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
 3. Return full-size samples to be incorporated into this Work.
 4. Submit product description with samples.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
1. Submit manufacturer's parts lists and templates.
 2. Bitting List: List of combinations as furnished.
- H. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- I. Installer's Qualification Statement.
- J. Supplier's Qualification Statement.
- K. District Responsibilities for submittal review:
1. Complete keying schedule.
 2. Complete keying legend.
 3. Provide original letter of authorization allowing hardware supplier to purchase keying hardware and to have the bitting list sent to District.
 4. Provide District the locksmith's name, address, phone number and email.
 5. Identify how doors are to be keyed.
 6. For existing systems, provide the registry number.
- L. Manufacturers' certificates that fire-rated hardware meets or exceeds specified requirements.
- M. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in District's name and registered with manufacturer.
- N. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- O. Maintenance Materials and Tools: Furnish the following for District's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Lock Cylinders: Ten for each master keyed group.
 3. Temporary Cores: Return to and receipt by Contractor.
 4. Tools: Two sets of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 REGULATORY REQUIREMENTS

- A. Fire-Rated Openings: Comply with NFPA 80. Provide only hardware tested and listed by UL for the type and size of each door required, which complies with the requirements of the door and frame labels. California State Fire Marshal Standard 12-7-4
 - 1. Where exit devices are required on fire rated doors, provide supplementary marking on door UL label indicating "Fire Door to be Equipped with Fire Exit Hardware", and provide UL label on exit device indicating "Fire Exit Hardware".
- B. Comply with State Fire Marshal Standard 12-10-3 Exits, Section 12-10-302.
 - 1. The cross-bar shall extend across not less than one-half the width of the door/gate.
 - 2. The ends of the cross-bar shall be curved, guarded or otherwise designed to prevent catching on the clothing of persons during egress.
- C. Conform to applicable requirements of the CBC Chapter 11B and ADA Standards regarding accessibility requirements for door and entrance hardware including gates.
 - 1. Doors/doorways as part of an accessible route shall comply with CBC Sections 11B-404.
 - 2. Doors shall meet California Building Code Sections 11B-206.5, 11b-404.1 and 1010.1.
 - 3. The clear opening width for a door shall be 32 inches minimum. CBC Section 11B-404.2.3
 - a. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees.
 - b. There shall be no projections into it below 34 inches and 4 inches maximum projections into it between 34 inches and 80 inches above the finish floor or ground.
 - c. Door closers and stops shall be permitted to be 78 inches minimum above the finish floor or ground.
 - d. Exception: Doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example: shallow closets.
 - 4. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.
 - a. Operable parts of such hardware shall be 34 inches minimum and 44 inches maximum above finish floor or ground.
 - b. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both side. CBC Section 11B-404.2.7

5. The force for pushing or pulling open a door shall be as follows : CBC Section 11B-404.2.9.
 - a. Interior Hinged Doors, sliding or folding doors, and exterior hinged doors: 5 lbs maximum.
 - b. Required Fire Doors: the maximum opening force allowable by the DSA authority, not to exceed 15 lbs..
 - c. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
 - d. The force required to activate any operable parts, such as retracting latch bolts or disengaging other devices, shall be 5 lbs. maximum to comply with CBC Section 11B-309.4.
6. Door closing speed shall be as follows: CBC Section 11B-404.2.8
 - a. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.
 - b. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
7. Thresholds shall comply with CBC Section 11B-404.2.5.
8. Floor stops shall not be located in the path of travel and 4 inches maximum from walls.
9. Pair of doors: Limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign. CBC Section 11B-703.4.2.1
- D. Door and door hardware encroachment: when door is swung fully-open into means-of-egress path, the door, including the hardware, may not encroach or project more than 7 inches into the required exit width. California Building Code 1005.7.1.
- E. SB 211 - DSA Bulletin 11-05
 1. Provide all latching devices that are lockable (including but not limited to door locks and panic/exit devices) that comply with CBC 1010.1.11:
 - a. All new construction projects to include locks that allow the doors to be locked from the inside.
 - b. The requirement applies to classrooms and any other room with an occupancy of 5 or more persons, but does not include doors that are locked from the outside at all times or student restrooms.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.09 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination:
 1. Coordinate hardware with other work.

2. Provide hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
3. Furnish related trades with the following information:
 - a. Location of embedded and attached items to concrete.
 - b. Location of wall-mounted hardware, including wall stops.
 - c. Location of finish floor materials and floor-mounted hardware.
 - d. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items.
 - 1) Fire/life-safety system interfacing.
 - 2) Point-to-point wiring diagrams plus riser diagrams to related trades.
 - e. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
 - f. Manufacturers' templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
 1. Closers: Five years, minimum.
 - a. Mechanical thirty year year for door closers.
 - b. Electrical two year year for door closers.
 2. Exit Devices: Three years, minimum.
 3. Locksets and Cylinders: Three years, minimum.
 - a. Seven years for extra heavy-duty cylindrical lock.
 4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 1. Applicable provisions of federal, state, and local codes.
 2. Comply with SB 211 (DSA Bulletin 11-05); CBC section 1010.1.11.
 3. Accessibility: ADA Standards, CBC Chapter 11B.

4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - a. Latching hardware, door closers, ball bearing hinges, and seals are required whether listed in the Hardware Schedule or not.
 6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 - a. Air Leakage Rate: Tested in accordance with UL 1784, with air leakage rate not to exceed 3.0 cfm/sf of door opening at 0.10 inch of water for both ambient and elevated temperature tests.
 7. Listed and certified compliant with specified standards by BHMA (CPD).
 8. Auxiliary Hardware: BHMA A156.16.
 9. Straps and Tee Hinges: BHMA A156.20.
 10. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
- D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Section 08 06 71 for listing of hardware sets.
1. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.
- E. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.
 3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
 4. Coordinate With Doors: Ensure provision of proper blocking to support machine screws at metal doors/frames to mounting panic hardware and door closers.
 5. No through-bolts are allowed on any door type.
 6. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

7. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.02 HINGES

A. Manufacturers:

1. Ives, an Allegion brand: www.allegion.com/us/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.

1. Self Closing Hinges: Comply with BHMA A156.17.
2. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - a. Provide hinge width required to clear surrounding trim.
 - b. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable.
 - 1) Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening.
 - 2) Advise Architect if 8 inch width is insufficient.
 - c. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled.
 - 1) Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
 - d. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
3. Continuous Hinges: Comply with BHMA A156.26.
4. Provide hinges on every swinging door.
5. Provide ball-bearing hinges at each door with closer.
6. Provide non-removable pins on exterior outswinging doors.
 - a. Out-swinging exterior doors: Non-ferrous with non-removable (NRP) pins and security studs.
 - b. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
7. Provide non-removable pins on interior outswinging doors at locations as indicated in Door Hardware Schedule.
8. Provide power transfer hinges where electrified hardware is mounted in door leaf.
9. Provide following quantity of butt hinges for each door:
 - a. Doors up to 60 inches High: Two hinges.
 - b. Doors From 60 inches High up to 90 inches High: Three hinges.
 - c. Doors 90 inches High up to 120 inches High: Four hinges.

2.03 AUTO FLUSH BOLTS

A. Manufacturers:

1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Automatic Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch, minimum.
 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
 4. Manual Flush Bolts: Not permitted.
 5. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.

2.04 EXIT DEVICES

- A. Comply with SB 211 (DSA Bulletin 11-05); CBC section 1010.1.11.
- B. Manufacturers:
1. Von Duprin, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
 2. Provide cylinder with cylinder dogging or locking trim.
 3. Provide exit devices properly sized for door width and height.
 4. Provide strike as recommended by manufacturer for application indicated.
 5. Releasable in normal operation with 5-lb. maximum operating force per California State CBC Chapter 11B-309.4.
 6. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate.
 7. Comply with CBC Section 1010.1.9 and State Fire Marshal Standard 12-10-3 Exits, Section 12-10-302.
 8. Trim to meet BHMA A156.3 Trim Security Test.
 9. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.05 LOCK CYLINDERS

- A. Manufacturers:
1. Schlage, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

1. Provide standard, conventional, and full size interchangeable core (FSIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.
4. Furnish keyed at factory of lock manufacturer where permanent records are maintained.
5. Locks and cylinders by the same manufacturer.
6. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.06 MORTISE LOCKS

- A. Comply with SB 211 (DSA Bulletin 11-05); CBC section 1010.1.11.
- B. Manufacturers:
 1. Schlage, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Mortise Locks: Complying with BHMA A156.13, Grade 1.
 1. Latchbolt Throw: 3/4 inch, minimum.
 2. Deadbolt Throw: 1 inch, minimum.
 3. Backset: 2-3/4 inch unless otherwise indicated.
 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Flat-Lip Strikes: Provide for locks with three piece antifriction latchbolts as recommended by manufacturer.
 - b. Aluminum-Frame Strike Box: Provide strike box fabricated for use with aluminum framing by framing manufacturer.
 - c. Rabbet Front and Strike: Provide on locksets for use with rabbeted meeting rails.
 - d. Finish: To match lock or latch.

2.07 AUXILIARY LOCKS (DEADLOCKS)

- A. Manufacturers:
 1. Schlage, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.
 1. Type: Bored (cylindrical).
 2. Application: Bored.
 3. Backset: 2-3/4 inch, unless otherwise indicated.
 4. Bolt Throw: 1/2 inch, with latch made of hardened steel.
 5. Provide strike that matches frame.

2.08 DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
 - 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Door Pulls and Push Plates: Comply with BHMA A156.6.
 - 1. Pull Type: Straight, unless otherwise indicated.
 - 2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
 - 3. Material: Aluminum, unless otherwise indicated.
 - 4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
 - 5. On solid doors, provide matching door pull and push plate on opposite faces.
 - 6. On glazed storefront doors, provide matching door pulls/push plates on both faces unless otherwise indicated.

2.09 COORDINATORS

- A. Manufacturers:
 - 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
 - 1. Type: Bar, unless otherwise indicated.
 - 2. Material: Aluminum, unless otherwise indicated.
 - 3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.10 CLOSERS

- A. Manufacturers; Surface Mounted:
 - 1. LCN, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Surface mounted to door.
 - 2. Provide door closer on each exterior door.
 - 3. Provide door closer on each fire-rated and smoke-rated door.
 - a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
 - 4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
 - 5. At corridor entry doors, mount closer on room side of door.

6. At outswinging exterior doors, mount closer on interior side of door.

2.11 ARMOR PLATES

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
 1. Size: 16 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

2.12 KICK PLATES

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 1. Size: 12 inch high by 2 inch less door width (LDW) on push side of door.

2.13 DOOR EDGE PLATES

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Door Edge Plates: Comply with BHMA A156.6.
 1. Provide along latching edge of door to protect from damage as objects are moved through door opening.
 2. Material: Aluminum, at least 0.050 inch thick.
 3. Type: Square edge, mortised into edge of door.

2.14 DOOR HOLDERS

- A. Door Holders: Comply with BHMA A156.16, Grade 1.
 1. Provide surface mounted door holders when wall or floor stop is not applicable and hold-open device is mounted on door.
 2. Type: Plunger with rubber floor bumper.
 3. Material: Aluminum.

2.15 FLOOR STOPS

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Provide floor stops when wall surface is not available; be cautious not to create a tripping hazard.
 - 2. Type: Manual hold-open, with pencil floor stop.
 - 3. Material: Aluminum housing with rubber insert.

2.16 ASTRAGALS

- A. Manufacturers:
 - 1. Zero International, Inc: www.zerointernational.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Astragals: Comply with BHMA A156.22.
 - 1. Provide recessed astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
 - 2. Type: Split, two parts, and with sealing gasket.
 - 3. Material: Aluminum, with neoprene weatherstripping.
 - 4. Provide non-corroding fasteners at exterior locations.

2.17 THRESHOLDS

- A. Manufacturers:
 - 1. Zero International, Inc: www.zerointernational.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
 - 2. Provide threshold at each exterior door, unless otherwise indicated.
 - 3. Type: Ramped, accessible with maximum 1:12 slope.
 - 4. Material: Aluminum.
 - 5. Threshold Surface: Fluted horizontal grooves across full width.
 - 6. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 7. Provide non-corroding fasteners at exterior locations.

2.18 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. Zero International, Inc: www.zerointernational.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Head and Jamb Type: Adjustable.
 - 2. Door Sweep Type: Encased in retainer.

3. Material: Aluminum, with brush weatherstripping.
4. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.19 SIGNAGE

- A. See Section 10 14 00 for additional signage requirements.

2.20 SILENCERS

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 1. Single Door: Provide three on strike jamb of frame.
 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 3. Material: Rubber, gray color.

2.21 KEY CONTROL SYSTEMS

- A. Manufacturers:
 1. Schlage, an Allegion brand: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Key Control Systems: Comply with guidelines of BHMA A156.28.
 1. Provide keying information in compliance with DHI (KSN) standards.
 2. Keying: Grand master keyed.
 3. Include construction keying and control keying with removable core cylinders.
 - a. Provide temporary keyed-alike cores.
 - b. Remove at substantial completion and install permanent cylinders/cores in District's presence.
 - 1) Demonstrate that construction key no longer operates.
 4. Key to existing keying system.
 - a. Factory registered master key system.
 - b. Schlage Restricted keyway, interchangeable core.
 - c. Contact District Locksmith with for keying requirements.
 - d. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers.
 - e. For estimate use factory GMK charge.
 - f. Furnish District's written approval of the system.

5. Supply keys in following quantities:
 - a. 4 each Master keys.
 - b. 1 each Grand Master keys.
 - c. 6 each Construction Master keys.
 - d. 15 each Construction keys.
 - e. 2 each Construction Control keys.
 - f. 2 each Control keys if new system.
 - g. 2 each Extra Cylinder cores.
 - h. 2 each Change keys for each keyed core.
6. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
7. Security Key Tags: For each keyed lock on project, provide one set of matching key tags for permanent attachment to one key of each set.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to District by security shipment direct from hardware supplier.
10. Bitting List: Use secured shipment direct from point of origination to District upon completion.
11. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."

2.22 KEY CABINET

- A. Manufacturers:
 1. Knox Company; Model 1300: www.knoxbox.com.
 2. Lund Equipment: www.lundkeycab.net.
 3. MMF Industries: www.mmfind.com.
 4. Telkee: www.telkee.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Key Cabinet: Sheet steel construction, piano hinged door with key lock; BHMA A156.28.
 1. Mounting: Wall-mounted.
 2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
 3. Size: 14-1/2 inches wide by 18 inches high by 5 inches deep.
 4. Size key hooks to hold 6 keys each.
 5. Finish: Baked enamel, manufacturer's standard color.
 6. Key cabinet lock to building keying system.

2.23 FIRE DEPARTMENT LOCK BOX

- A. Manufacturers:

1. Knox Company; Knox-Box Rapid Entry System; Model 3227: www.knoxbox.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Department Lock Box: at Buildings or Site Walls
1. Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
 2. Capacity: Holds 10 keys.
 3. Finish: Manufacturer's standard dark bronze.
 4. Mounted to posts at manual gates (for driveways/roads) and as indicated on Drawings:
 - a. Key lock boxes shall be located at driver's side of gate entrance in a visible location as directed by Fire Department.
 - 1) Box shall be welded secure to metal posts. Box shall be 4 to 4-1/2 feet from top of box to finished grade.
 - b. Obtain approval from Fire Department of mounting location/position and operating standards before installation.
 - c. Products:
 - 1) Knox Company; Model 3208 or 3166, as applicable.
 - 2) Knox Decal 1001 shall be placed on gate.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements. Only if allowed or required by local Fire Department.
- C. Provide Knox Fire Department alert decals on all exterior doors of the facility and on all interior doors that keys have been furnished for within the lock box.
1. If the building/facility is protected with a fire alarm system or burglar alarm system, the lock boxes shall be "tamper" monitoring.
 2. The tamper monitoring must include the following:
 - a. All central stations shall be UL listed.
 - b. For combination Fire/Burglar Alarm Panels, the Knox Box monitoring shall be through the fire side of the panel.
 - c. Central stations upon receiving a Knox Box tamper alarm signal shall:
 - 1) Notify and respond to local Police Department (Knox Box tamper).
 - 2) Notify and respond to the local Fire Department (Knox Box tamper).

2.24 FINISHES

- A. Finishes: Identified in Section 08 06 71 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

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

- C. Field-verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware.
- D. Remove existing hardware not being reused. Tag and bag removed hardware, turn over to District.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
 - 1. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 2. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
 - a. Gaskets:
 - 1) Install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals.
 - 2) Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 - b. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
 - c. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 - d. Replace fasteners damaged by power-driven tools.
 - 3. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.
 - 4. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to District items not scheduled for reuse.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- D. Existing frames and doors to be retrofitted with new hardware:
 - 1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.
 - 2. Remove existing floor closers not scheduled for reuse, fill cavities with non-shrinking concrete and finish smooth.
 - 3. Cut and weld existing steel frames currently prepared with 2.25 inch height strikes. Cut an approximate 8 inch section from the strike jamb and weld in a reinforced section to accommodate specified hardware's strike.
 - 4. Patch and weld flush filler pieces into existing door hardware preparations in steel doors and frames, leave surfaces smooth.
 - 5. Glue in solid wood block fillers to fill cut outs in existing wood doors, sand surfaces smooth. Alternatively, use an approved epoxy-based wood filler product, submit product data for approval.

6. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed, extended arms on closers.
 7. Provide manufacturer's recommended brackets to accommodate the mounting of closers on doors with flush transoms.
- E. Use templates provided by hardware item manufacturer.
- F. Do not install surface mounted items until application of finishes to substrate are fully completed.
- G. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
1. Comply with California Building Code, Section 1010.1.9.2, 11B-309.4 and 11B-404.2.7.
 - a. Refer also to CBC requirements noted in Part 1 of this section.
 2. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 3. For Steel Doors and Frames: Refer to Section 08 11 13.
 4. For Aluminum-Framed Storefront Doors and Frames: Refer to Section 08 43 13.
 5. Mounting heights in compliance with ADA Standards and CBC Chapter 11B:
 - a. Locksets: 34 to 44 inches.
 - b. Push/Pulls: 34 to 44 inches.
 - c. Dead Locks: 44 inches.
 - d. Exit Devices: 36 (clear) to 44 inches.
 - e. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware when compliant with codes.
- H. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
1. Refer to Section 07 92 00 for additional requirements.
- I. Locate floor stops no more that 4 inches (maximum outside dimension) from walls and not within paths of travel. See Article "Hinges" in Part 2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- J. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.
- B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

- B. Adjust hardware for smooth operation.
 - 1. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 - a. Hardware damaged by improper installation or adjustment methods: repair or replace to District's satisfaction.
 - b. Adjust doors to fully latch with no more than 1 pound of pressure.
 - c. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
 - d. Adjust door closers per "Commissioning" article below.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- D. Fire-rated doors (NFPA 80):
 - 1. Steel Doors: Adjust to 1/16 inch minimum to 3/16 inch maximum clearance at heads, jambs, and meeting stiles.
 - 2. Adjust wood and steel doors to 3/4 inch maximum clearance (undercut) above threshold or finish floor material under door.
- E. Inspection of fire door assemblies and means-of-egress panic-hardware doors:
 - 1. Per NFPA 80 5.2.1:
 - a. Provide an independent third-party inspection service to prepare a report listing these doors, and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.
 - b. Certification, Testing and Quality Control shall be in accordance with Section 01 45 33 - Code-Required Special Inspections.
 - c. All doors hardware and installation will be inspected by a third party selected by the Architect/District.
- F. Final inspection: Installer to provide letter to District that upon completion installer has visited the Project and has accomplished the following:
 - 1. Has re-adjusted hardware.
 - 2. Has evaluated maintenance procedures and recommend changes or additions, and instructed District's personnel.
 - 3. Has identified items that have deteriorated or failed.
 - 4. Has submitted written report identifying problems.

3.05 COMMISSIONING:

- A. Conduct these tests prior to request for certificate of substantial completion:
 - 1. Inspection of fire door assemblies and means-of-egress panic-hardware doors:
 - a. Contractor shall provide an independent third-party inspection service to prepare a report listing the proper operation and functionality of these doors.
 - b. Include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.
 - 2. With installer present, test door hardware operation for compliance with push and pull force requirements per ADA and CBC.

3.06 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

- A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.08 CLOSEOUT

- A. Return of temporary cores for return/receipt by Contractor.
- B. Final inspection: Installer to provide letter to District that upon completion installer has visited the Project and has accomplished the following:
 - 1. Has re-adjusted hardware.
 - 2. Has evaluated maintenance procedures and recommend changes or additions, and instructed District's personnel.
 - 3. Has identified items that have deteriorated or failed.
 - 4. Has submitted written report identifying problems.

3.09 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. No hardware shall be ordered until Finish Hardware has been reviewed and approved by Architect's hardware consultant.
- C. Provide Factory order numbers for all products supplied on this project as part of close out documents for Owner's warranty records.
- D. See schedule in Section 08 06 71 - Door Hardware Schedule.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazing units.
- B. Plastic films.
- C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- C. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.
- D. Section 10 28 00 - Toilet Accessories: Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. GANA (GM) - GANA Glazing Manual.
- K. GANA (SM) - GANA Sealant Manual.
- L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- M. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 8 by 8 inch in size of glass units.
- E. Samples: Submit 4 inch long bead of glazing sealant, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.
- J. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

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

1.07 FIELD CONDITIONS

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

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
 - 1. Remedial Provisions: Upon notification of defects, within the warranty period, party providing warranty or guarantee shall replace the glass and glazing at no cost to District.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with the all applicable codes and ordinances, including California Building Code (CBC), Title 24, Part 2, Chapter 24 as amended and adopted by authorities having jurisdiction, and US Consumer Product Safety Commission Standard 16 CFR 1201 CI and CII.
- B. Where safety glass is indicated or required, provide glazing materials that conform to ANSI Z97.1 and CPSC 16 CFR 1201 and are so identified in accordance with CBC Section 2406.3.
- C. Glass Identification:
 - 1. Per CBC Section 2403.1, each light shall bear the manufacturer's label designating the type and thickness of glass.
 - a. When approved by the enforcement agency, labels may be omitted from other than safety glazing materials, provided an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved plans and specifications.
 - b. Identification of safety glazing material installed in hazardous locations as defined in Section 2406 of this chapter shall be identified by label which will specify the labeler, whether the manufacturer or installer, and state that safety glazing material has been utilized in such installations.
 - c. The label shall be legible and visible from the inside of the building after installation and shall specify that label shall not be removed.
 - d. Tempered glass shall have an etched manufacturer's label.

2.02 MANUFACTURERS

- A. Glass Fabricators:
 - 1. Glasswerks Inc.: www.glasswerks.com.
 - 2. GlasPro, Inc.: www.glas-pro.com
 - 3. Viracon, Inc: www.viracon.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Float Glass Manufacturers:
 - 1. AGC Glass North America, Inc: www.agcglass.com/#sle.
 - 2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 3. GlasPro, Inc.: www.glas-pro.com
 - 4. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 5. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 6. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7.
 - a. Where glass thicknesses are not indicated, provide thickness based on the wind pressures required by the California Building Code (CBC), Title 24, Part 2, 2403 and 2404, wind pressure shall be assumed to have a one minute duration.
 - b. Upon first application of design wind load for the specified durations, probability of breakage shall not exceed 8/1000 for vertical glass.
 - c. Probability of breakage relative to glass thermal stress shall not exceed 8/1000 for vertical glass.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
 - 4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 5. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 - 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
 - 2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
 - 3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.04 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.05 GLAZING UNITS

- A. Monolithic Interior Vision Glazing:
 1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Annealed float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
 5. Glazing Method: Dry glazing method, gasket glazing.
- B. Monolithic Safety Glazing: Non-fire-rated.
 1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Glazed view windows and panels in partitions enclosing athletic activity rooms, except in fire-rated walls and partitions.
 - d. Other locations required by applicable federal, state, and local codes and regulations.
 - e. Other locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
 5. Glazing Method: Dry glazing method, gasket glazing.

2.06 PLASTIC FILMS

- A. Type GF-2 - Decorative Plastic Film: Polyester type.
 1. Application: Locations as indicated on drawings.
 2. Color: Acid Etch.
 3. Thickness Without Liner: 0.002 inch.

2.07 GLAZING COMPOUNDS

- A. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- B. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.08 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
 - 1. Width: As required for application.
 - 2. Thickness: As required for application.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

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

3.02 PREPARATION

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

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- C. Remove non-permanent labels immediately after glazing installation is complete.
- D. Clean glass and adjacent surfaces after sealants are fully cured.
- E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

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

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - a. Moisture vapor seal is required at all locations to receive resilient flooring regardless of moisture test.
 - 2. Carpet tile.
 - a. Sealer is not needed under Tandus Power Bond Carpet.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.
- C. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.
- D. Section 03 30 00 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.
- E. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).

- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1. Manufacturer's qualification statement.
 - 2. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
 - 3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - 4. Manufacturer's installation instructions.
 - 5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.
- D. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and alkalinity (pH) test reports.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.
 - 6. Include certification of accuracy by authorized official of testing agency.
 - 7. Submit report to Architect.
 - 8. Submit report not more than two business days after conclusion of testing.
- E. Adhesive Bond and Compatibility Test Report.

- F. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.
- G. Copy of RFCI (RWP).

1.06 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 - 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project District's project contact information.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
 - 1. Provide access for and cooperate with testing agency.
 - 2. Confirm date of start of testing at least 10 days prior to actual start.
 - 3. Allow at least 4 business days on site for testing agency activities.
 - 4. Achieve and maintain specified ambient conditions.
 - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- E. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.
- F. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 4. Products:
 - a. ARDEX Engineered Cements, Inc; ARDEX K-15: www.ardexamericas.com.
 - b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
 - c. Mapei International; Mapei Ultraplan 1 Plus: www.mapei.com.
 - d. Sika Corporation; Sika Level-315: www.sikafloorusa.com.
 - e. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 - 2. Products:
 - a. ARDEX Engineered Cements; Ardex MC ULTRA with ARDEX FEATHERFINISH: www.ardexamericas.com/#sle.
 - b. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.
 - c. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: www.floorseal.com/#sle.
 - d. Koster American Corporation; Koster VAP I 2000 with Koster SL Premium overlay: www.kosterusa.com/#sle.

- e. LATICRETE International, Inc; LATICRETE NXT Vapor Reduction Coating with LATICRETE NXT Level Plus: www.laticrete.com/#sle.
- f. LATICRETE International, Inc; LATICRETE SUPERCAP Moisture Vapor Control with LATICRETE SUPERCAP Underlayment: www.laticrete.com/#sle.
- g. Maxxon Corporation; Aquafin SG2: www.maxxon.com/#sle.
- h. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com/#sle.
- i. Tnemec Company, Inc; Series 208 Epoxoprime MVT: www.tnemec.com/#sle.
- j. USG Corporation; Durock Brand CST Moisture Vapor Reducer: www.usg.com/#sle.
- k. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Follow recommendations of testing agency.
- B. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 - 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Do not attempt to remove coating or penetrating material.
 - b. Do not abrade surface.
 - 3. Preliminary cleaning.
 - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 7. Specified remediation, if required.
 - 8. Patching, smoothing, and leveling, as required.
 - 9. Other preparation specified.
 - 10. Adhesive bond and compatibility test.
 - 11. Protection.
- C. Remediations:
 - 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 - 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that

adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with recommendations of testing agency.
- C. Comply with requirements and recommendations of floor covering manufacturer.
- D. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- E. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.
- B. Install remedial coating over all concrete floor areas where moisture emission and/or alkalinity exceeds the floor covering manufacturer's published limits.
- C. Prepare floor areas to be coated in accordance with coating manufacturer's requirements.
 - 1. Mask and protect adjacent wall and floor surfaces from damage due to this work.
- D. Apply coating using manufacturer's recommended procedures.
- E. Apply 1/8 inch thick cementitious surfacing over coating in areas to receive adhesively applied floor coverings.

- F. Verify that prepared floor slab has moisture emission rate and alkalinity meeting requirements.

3.10 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Cementitious backing board.
- G. Gypsum wallboard.
- H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.
- C. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- D. Section 07 21 00 - Thermal Insulation: Acoustic insulation.
- E. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.
- F. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- G. Section 09 30 00 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 1. Use 2013 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 1. Use 2014 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- L. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
 - 1. Use 2014a as indicated in 2019 CBC Ch. 35 Referenced Standards.
- M. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
 - 1. Use 2014a as indicated in 2019 CBC Ch. 35 Referenced Standards.
- N. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- R. ASTM E413 - Classification for Rating Sound Insulation.
- S. GA-216 - Application and Finishing of Gypsum Panel Products.
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- T. GA-600 - Fire Resistance Design Manual.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- U. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
 - 1. Joint Treatment Materials: Submit manufacturer's product data, indicating VOC content.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

- D. Application Procedures: Submit a general written description of procedures to be followed where fire-rated work is being done and where alternative assemblies are proposed.
- E. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.
- B. Regulatory Requirements: Conform to California Building Code (CBC), Title 24, Part 2, Chapter 7, Chapter 8, and Chapter 25, as amended and adopted by authorities having jurisdiction.
- C. Fire Resistance Rating:
 - 1. Certain partition constructions gypsum wallboard systems are required to meet fire resistive requirements of ASTM E119 and applicable building Codes.
 - 2. Construction which forms component parts of such assemblies shall be constructed to afford the fire resistance required by Code for the location and condition of construction indicated.
 - 3. See required ratings and designs on Drawings.
 - 4. Construction shall conform to requirements of these tested assemblies.
 - 5. Fire Resistive Gypsum Board: Material shall bear the Underwriters' Laboratories, Inc. (UL) label or label of other testing organization acceptable to the State Fire Marshal.
- D. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:

1. CBC Chapter 7 Item Numbers: Comply with applicable requirements of CBC Chapter 7 Tables for the particular assembly; as indicated on Drawings.
2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly; as indicated on Drawings.
3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD); as indicated on Drawings.

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 1. Cemco: www.cemcosteel.com.
 - a. ICC ESR-2012.
 - b. Viper-x Studs: IAPMO ER-0524, ICC ESR-2620.
 2. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
 - a. ICC ESR-1166P
 3. Marino: www.marinoware.com/#sle.
 - a. Viper-x Stud: IAPMO ER-0524, ICC ESR-2620.
 - b. ICC ESR-4062.
 4. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
 5. SCAFCO Corporation: www.scafco.com/#sle.
 6. Steel Stud Manufacturers Association www.ssma.com.
 - a. ICC ESR-3064P
 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Structural Steel Framing for Application of Gypsum Board: As specified in Section 05 40 00.
- C. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 1. Studs: C-shaped with knurled or embossed faces.
 2. Runners: U shaped, sized to match studs.
 3. Headers: As detailed on Drawings or ProX Header per IAPMO ER-2086.
 4. Ceiling Channels: C-shaped.
- D. Sheet Metal Backing: 54 mil (0.0566) inch thick, galvanized for attachment and support of products to be attached to framing..
 1. 16 gage(54-mil) material covering full width of stud spacing by 6 inches wide minimum.
 2. 6 by 1-1/4 inch by 14 gage flush mount backing with pre-punched screw holes, FLUSH-MOUNT Backing by Metal-Lite Inc., www.metal-lite.net or approved equivalent.
 3. As indicated on Drawings.
- E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
 4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
 - a. Products:
 - 1) ClarkDietrich; BlazeFrame RipTrak: www.clarkdietrich.com/#sle.
 - 2) FireTrak Corporation; Posi Klip: www.fire-trak.com/#sle.
 - 3) Metal-Lite, Inc; The System: www.metal-lite.net/#sle.
 - 4) Super Stud Building Products, Inc; Slotted Deflection Track: www.buysuperstud.com/#sle.
 - 5) Substitutions: See Section 01 60 00 - Product Requirements.
- F. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
1. Products:
 - a. BlazeFrame: "BlazeFrame"; www.blazeframe.com.
 - b. Brady Sliptrack Systems: FAS Track; www.sliptrack.com, ICC-ES ESR-2012.
 - c. CEMCO: FAS Track; www.cemcosteel.com, ICC-ES ESR-2012.
 - d. ClarkDietrich; BlazeFrame Firestop Deflection Track: www.clarkdietrich.com/#sle.
 - e. Rectorseal, Inc.; Track-Safe: www.biofireshield.com.
 - f. Ware Industries, Inc. (dba Marinoware): ViperTrack; www.marinoware.com, ICC-ES ESR-2620.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Preformed Top Track Firestop Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
 2. Products:
 - a. CEMCO: HOT ROD Type X and XL; www.cemcosteel.com, ICC-ES ESR-2012.
 - b. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
 - c. Ware Industries, Inc. (dba Marinoware): HOT ROD Type X and XL; www.marinoware.com, ICC-ES ESR-2620.
 - d. Specified Technologies Inc; SpeedFlex TTG Track Top Gasket: www.stfirestop.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

- a. Provide a premanufactured wall brace compliant with CBC Section 1607A.15.
 - b. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - c. Height: 35-3/4 inches.
 - d. Products:
 - 1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
 - 2) The Steel Network, Inc.; MidWall; www.steelnetwork.com.
 - 3) USG, Inc.; www.usg.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 - e. Alternate Method Partial-Height Wall Brace: Provide steel post as indicated on Drawings.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

2.03 BOARD MATERIALS

- A. General: Gypsum board, joint treatment and finishing materials shall be manufactured from asbestos-free materials.
- B. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 4. PABCO Gypsum: www.pabco gypsum.com/#sle.
 - 5. USG Corporation: www.usg.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required at all locations.
 - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 - 5. Mold Resistant Paper Faced Products:
 - a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 - b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.

- c. Georgia-Pacific Gypsum; ToughRock Mold-Guard: www.gpgypsum.com/#sle.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
 - e. National Gypsum Company; Gold Bond XP Gypsum Board: www.nationalgypsum.com/#sle.
 - f. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Abuse Resistant Wallboard:
- 1. Application: High-traffic areas indicated.
 - a. Corridors.
 - b. Restrooms.
 - c. Storage Rooms.
 - d. Areas as indicated on Drawings.
 - e. Provide up to 96 inches, minimum.
 - 2. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 6. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 - 7. Type: Fire-resistance-rated Type X, UL or WH listed.
 - 8. Thickness: 5/8 inch.
 - 9. Edges: Tapered.
 - 10. Paper-Faced Products:
 - a. CertainTeed Corporation; Extreme Abuse Resistant Drywall with M2Tech: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant: www.gpgypsum.com/#sle.
 - c. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board: www.nationalgypsum.com/#sle.
 - d. USG Corporation; Fiberock Brand Panels--Abuse-Resistant.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
- 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Type X Thickness: 5/8 inch.

5. Regular Board Thickness: 5/8 inch.
6. Edges: Tapered.
7. Products:
 - a. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
 - b. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board:
www.gpgypsum.com/#sle.
 - c. Lafarge North America Inc; Mold Defense Drywall.
 - d. National Gypsum Company; Gold Bond XP Gypsum Board:
www.nationalgypsum.com/#sle.
 - e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2 inch.
 1. Application:
 - a. Partitions with STC Rating:
 - 1) Insulation fill at gypsum board partition stud framing.
 - 2) Surround penetrations in gypsum board partitions.
 - b. Gypsum board ceilings adjacent to sound-rated partitions.
 2. Surface Burning Characteristics as per ASTM E84: Flame Spread of 10; Smoke Developed of 10.
 3. Products:
 - a. Owens-Corning; Sound Attenuation Batts: www.owenscorning.com.
 - b. CertainTeed; "NoiseReducer" Sound Attenuation Batts: www.certainteed.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Sealants: For penetrations at fire-rated construction, provide firestopping as specified in Section 07 84 00 - Firestopping.
- C. Acoustic Foam Tape: 2 inch wide by 1/4 inch thick neoprene foam gasket/sealing tape.
 1. SCE-41 Grade Neoprene sponge with a rubber based adhesive one side.
 2. Adhesive to utilize a white Kraft paper liner.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Manufacturers - Finishing Accessories:
 - a. Flannery, Inc.: flannerytrim.com.
 - b. Fry Reglet: fryreglet.com.
 - c. Phillips Manufacturing Co: www.phillipsmfg.com.
 - d. Pittcon Industries: www.pittconinsutries.com
 - e. Trim-tex, Inc.: www.trim-tex.com.
 - f. CEMCO Products, Inc; www.cemco.com.
 - g. USG Corporation: www.usg.com

- h. Substitutions: See Section 01 60 00 - Product Requirements.
- 2. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Cornerbead: USG Sheetrock B1 XW EL, or equal.
 - b. L Trim: USG Paper-faced "L" trim, B4 or equal.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Joint Compound: Drying type, vinyl-based, ready-mixed.
 - 3. Joint Compound: Setting type, field-mixed.
- F. Abuse Resistant Finishes:
 - 1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- J. Adhesives
 - 1. Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.
 - a. Adhesive shall contain a maximum VOC content of 50 grams per liter.
 - b. Adhesive must meet the requirements of low emitting materials credit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Coordinate gypsum board Work with Work specified in other Sections to properly locate framing members and to provide additional framing and backing as necessary for recessed and built-in components.
 - 1. Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board.
 - 2. Maintain a minimum temperature of 50 degrees F for a period extending from 48 hours before installation until the joint compounds have completely dried.
- C. Examine substrates which gypsum board wall construction attaches to or abuts, including the following.
 - 1. Preset hollow metal frames
 - 2. Piping.
 - 3. Conduit.

- 4. Ductwork.
- D. Beginning of installation means acceptance of substrate.
- E. Provide adequate and continuous ventilation to ensure proper drying, setting or curing of taping and finishing compunds. Provide temporary air circulators in enclosed areas lacking natural ventilation. GA-216, article 18.2.
- F. Provide fixtures, anchors, sleeves, inserts and miscellaneous items, and provide openings and chases as necessary. Prior to closing in and finishing of drywall Work, ascertain that piping, conduit, ductwork and fixtures which are to be concealed and which penetrate gypsum boards are in place, tested and approved.
- G. Scaffolding: Construct, erect and maintain in conformance with applicable laws and ordinances.
- H. Fire Protection: Where required, the Work shall comply with the requirements for the protection rating indicated in the governing building code.
- I. Fire Sprinkler System: In areas where sprinkler heads occur, exercise care when installing drywall work. Do not damage or obstruct the heads in any way.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.
 - 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure in all locations.
 - 2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
 - 1. Orientation: Vertical.
 - 2. Spacing: As indicated.
- F. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.
- G. Blocking: Install wood blocking (backing) for support of:
 - 1. Framed openings.
 - 2. Wall-mounted cabinets.

3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.
7. Wall mounted equipment
8. Wall mounted handrails
9. Other locations, where indicated.
10. Where sheet steel blocking(backing) is used on a wall with level 5 surface finish, provide shims between stud face and gypsum board panel to maintain a visually smooth level surface.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.
 2. Place continuous bead at perimeter of each layer of gypsum board.
 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.
- C. Acoustic Tape: Place on top of all partition walls that do not project above suspended ceiling assemblies. Adhesive side shall be place on top of the wall.

3.04 BOARD INSTALLATION

- A. Regulatory Requirements: Install gypsum board products in accordance with applicable Code requirements and requirements of listed assemblies shown on Drawings.
- B. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- C. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
 2. In wood frame construction, erect panels horizontally only.
- D. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- E. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

1. Single Layer: Install and fasten gypsum board in accordance with CBC Title 24, Part 2, Table 721.1(2) for steel or wood construction. Install gypsum board vertically, with edges and ends occurring over firm bearing.
 2. Double Layer: Install and fasten gypsum board in accordance with CBC Title 24, Part 2, Table 721.1(2). Install base layer horizontally with ends occurring over firm bearing. Install face layer vertically with ends and edges occurring over firm bearing. Stagger joints 24 inches each side and opposite sides. Attach with required screws.
- F. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
- H. Fastener Spacing: Space fasteners in accordance with reference standards and fire rating requirements of wall, partition, floor and ceiling assembly. Maximum spacing of 1-inch screws 8 inches on centers at vertical edges and 12 inches on centers in field and at top and bottom.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Use longest practical lengths. Place corner beads at external corners. Place edge trim when gypsum board abuts dissimilar materials. Surfaces indicated to receive non-textured finish and semi-gloss enamels.
- B. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- C. Corner Beads: Install at external corners, using longest practical lengths.
- D. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 1. Level 5: Walls and ceilings to receive, eggshell, semi-gloss or gloss paint finish and other areas specifically indicated. (Including High-Gloss thin wallcovering.)
 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 3. Level 3: Walls to receive textured wall finish or heavy textured paint.
 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 6. Level 0: Temporary partitions.

- D. Tape, fill, and sand all exposed joints, edges, and corners, including inside corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Tape shall be set over joint and seated into joint compound, leaving sufficient adhesive under tape to provide proper bond.
 - 3. Internal angles, both horizontal and vertical, shall be reinforced and with tape folded to form straight and true angle.
 - 4. Metal external corners shall be cemented in place.
 - 5. Joints shall be allowed to dry according to Gypsum Association Standards based on temperature and humidity. Allow for at least 24 hours between each application of joint compound.
 - 6. The final application of compound and sanding shall leave all surfaces uniformly smooth and in condition to receive specified finish.
 - 7. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
 - 8. Taping, filling, and sanding are not required at base layer of double-layer applications.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

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

3.08 REPAIR, CLEAN-UP AND PROTECTION

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

END OF SECTION

SECTION 09 22 36

LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lath for cement plaster.
- B. Furring for metal lath.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 63 Rough Carpentry: Sheathing on exterior walls.
- B. Section 07 25 00 - Weather Barriers: Weather barrier under exterior plaster and stucco.
- C. Section 08 31 00 - Access Doors and Panels: Product requirements for metal access panels integral with metal lath.
- D. Section 09 21 16 - Gypsum Board Assemblies: Sheathing on exterior walls.
- E. Section 09 24 00 - Cement Plastering.

1.03 REFERENCE STANDARDS

- A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.
- B. ASTM C847 - Standard Specification for Metal Lath.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- E. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.
- F. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
- G. Plaster Assemblies Manual - Technical Information Services Bureau (TSIB) of Western Walls & Ceilings Contractors Association (WWCCA); Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lath: All products listed are "or equal".
 - 1. Brand X Metals: www.brandxmetals.com.
 - 2. CEMCO: www.cemcosteel.com/#sle.
 - 3. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
 - 4. Fry Reglet: www.fryreglet.com.
 - 5. Pittcon Industries: www.pittconindustries.com.
 - 6. Structa Wire Corporation; Structalath: www.structawire.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING AND LATH ASSEMBLIES

- A. Provide completed assemblies with the following characteristics:
 - 1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
 - 2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.
- B. Fire Rated Assemblies: Provide components complying with requirements for fire rated assemblies specified in the section where the plaster finish is specified.

2.03 FRAMING MATERIALS

- A. Furring Channels: Formed steel, minimum 0.020 inch thick, 3/8 inch deep by 7/8 inch high, splicing permitted; galvanized.
- B. Main Ceiling Channels: Formed steel, asphalt coated, minimum 0.05 inch thick, 3/4 inch deep by 1-1/2 inch high, single piece, no splicing; galvanized.
- C. Hangers: Steel wire, of size and type to suit application, to support ceiling components in place to deflection limits as indicated.
- D. Ceiling Hangers: Rolled steel sections, of size and type to suit application, to rigidly support ceiling components in place to deflection limits as indicated; galvanized.
- E. Lateral Bracing: Formed steel, minimum 0.060 inch thick, size and length as required; galvanized.

2.04 LATH

- A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
 - 1. Weight: To suit application, comply with deflection criteria, and as specified in ASTM C841 or ASTM C1063 for framing spacing.
 - 2. Minimum Weight: 3.4 lb/sq yd.
- B. Ribbed Metal Lath: ASTM C847, galvanized; 3/8 inch thick. For soffit use only.
 - 1. Weight: To suit application, comply with deflection criteria, and as specified in ASTM C841 or ASTM C1063 for framing spacing.

2. Minimum Weight: 3.4 lb/sq yd.
- C. Corner Mesh: ASTM C1063; Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.
- D. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.
- E. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
 1. Galvanized Steel Accessories:
 - a. Types specified below conforming to Technical Services Information Bureau of the Western Walls and Ceilings Contractors Association (WWCCA) "Plaster Assemblies Manual".
 - b. Where galvanized accessories are specified, use hot-dip galvanized steel, ASTM A653, designation G60.
 - c. Provide metal shapes, of longest possible length, used as grounds of such size and dimension as to provide for required plaster thickness.
 2. Material: Formed galvanized sheet steel, expanded metal flanges.
 3. Casing Beads with Weep Holes: Square edges.
 - a. Product: #66 Expanded Flange Casing Bead manufactured by Cemco.
 - b. Fabricated of 26 gage hot-dip galvanized steel. Provide beads with expanded metal flange and inverted vee at plaster edge of face flange.
 4. Corner Beads: Square-Edge corners.
 - a. Corner Reinforcement: Fabricated from expanded metal with large openings, from welded or woven copper bearing steel wire of minimum 28 gage, hot-dip galvanized, minimum 3 inches wide.
 - 1) Product: No. 2-A Corner Bead manufactured by Cemco.
 - 2) Product: No. 2-A Reinforced Flange Corner Bead manufactured by Cemco.
 - b. Cornerite: Expanded Metal, weighing 0.105 pounds per lineal foot, bent in center to form 105 degree angle, 6 inches wide (total).
 - 1) Product: Cornerite manufactured by Cemco.
 5. Base Screeds: Bevelled edges.
 - a. Foundation Weep Screeds: Perforated type.
 - 1) Product: No. 7 Foundation Sill Screed manufactured by Cemco.
 - 2) Product: No. 7 Extended Foundation Screed manufactured by Cemco. For locations where plaster is just above a paving surface.
 6. Drip Screeds: Fabricated from 0.018 inch thick; G-90 hot-dip galvanized steel.
 - a. Product: #12 Soffit Drip Edge manufactured by Cemco.
 - b. Product: #6 Head Drip Screed manufactured by Cemco. For locations above other flashing such as door and window heads.
 7. Window/Door Drips: Self weeping 26 gage hot-dip galvanized steel.
 - a. Product: No. 3 Flashing Screed manufactured by Cemco. For locations where plaster is offset 1-1/2 inches back from projection.

8. Strip Lath: Strip Reinforcement (Expanded Metal), weighing 2.5 lbs/sq.yd., 6 inches wide. Use hot-dip galvanized at all locations where galvanized metal lath occurs.
9. Control Joints: Accordion profile with factory-installed protective tape, 2 inch flanges.
 - a. Product: Double "V" Control Joint (#15) manufactured by Cemco.
 - b. Stress Relief Joints (Expansion and Control Joints): Stress Relief Control Joints, fabricated of 26 gage (0.0217 inch) hot-dip galvanized steel with G60 hot-dip galvanized coating.
 - 1) Recesses on control joints shall be covered with removable tape or filled with rope to prevent plaster from filling the recess.

2.05 ACCESSORIES

- A. Access Panels: As specified in Section 08 31 00.
- B. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized per ASTM C1063.
 1. At Vertical Surfaces:
 - a. Tie Wire: 18 gage.
 2. At Horizontal Surfaces:
 - a. Tie Wire: 18 gage, double strand.
- C. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.
 1. At Vertical Surfaces:
 - a. Screws: Self-drilling TEKS for metal stud attachment.
 2. At Horizontal Surfaces:
 - a. Screws: Self-drilling TEKS for metal stud attachment.
- D. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.
- C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.
 1. Do not allow the control or expansion joints to interrupt or be lapped with the weather barrier.
- D. Do not begin until unacceptable conditions have been corrected.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

- A. Install interior lath and furring for gypsum plaster in accordance with ASTM C841.
- B. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

- C. Install lath and furring for fire-rated assemblies in accordance with requirements of assembly as indicated.

3.03 CEILING AND SOFFIT FRAMING INSTALLATION

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

3.04 CONTROL AND EXPANSION JOINT INSTALLATION

- A. At unsheathed open framing, provide double stud construction behind control joint.
- B. Locate joints as indicated on drawings and comply with ASTM C1063.
 - 1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
 - a. Expansion Joint Spacing: 36 feet on center and as indicated on drawings.
 - 2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
 - 3. Spacing between control joints not to exceed 18 ft in each direction.
 - a. Narrow panels should not exceed 12 feet in length.
 - 4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.
 - 5. Vertical control joints should pass through horizontal control joints. Vertical control joints must terminate at horizontal expansion joints.
 - 6. Joint Placement: Approved by Architect before plastering.
- C. Install expansion joints where an expansion joint occurs in base exterior wall.
- D. Install prefabricated joint accessories in accordance with ASTM C1063.
 - 1. Install factory-made joints at reveal-to-reveal and reveal-to-control joint intersections.
- E. Discontinue metal lath at joint and apply 12 inch wide strip of flexible flashing behind each joint
- F. Hold casing beads back 3/8 to 1/4 inch from abutting frames and other elements to provide joint for sealant.
- G. Apply sealant at splices, intersections and terminals in accordance with Section 07 92 00 - Joint Sealants.

3.05 ACCESS PANELS INSTALLATION

- A. Install access panels and rigidly secure in place.
- B. Install frames plumb and level in opening. Secure rigidly in place.
- C. Position to provide convenient access to concealed work requiring access.

3.06 LATH INSTALLATION

- A. Apply lath taut, with long dimension perpendicular to supports.
- B. Lath shall not be continuous through control or expansion joints.
- C. Apply ribbed lath with self-furring ribs perpendicular to supports at soffits and horizontal surfaces.
 - 1. Lap sides of ribbed lath minimum 1-1/2 inches.
 - 2. Nest outside ribs of rib lath together.
 - 3. Attach lath to supports using specified screws at maximum 6 inches on center vertical and 16 inches on center horizontal.
 - 4. At horizontal metal lath application, secure lath to each support with specified screw s.
- D. Expanded metal lath at vertical supports, apply self-furring "grooved" metal lath with self-furring rib perpendicular to supports.
 - 1. Install per Table 2507.2 California Building Code.
 - 2. Installation shall maintain lath 1/4 inch away from vertical supports.
- E. Attach metal lath to supports using screws at maximum 12 inches on center.
- F. Attach horizontal metal lath to metal supports using tie wire at maximum 6 inches on center vertical.
- G. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- H. Place corner bead with mesh at external wall corners; fasten at outer edges of lath only.
- I. Place strip lath diagonally at corners of lathed openings. Secure rigidly in place.
- J. Place strip lath centered over junctions of dissimilar backing materials on same plane. Secure rigidly in place.
- K. Place base screeds at termination of plaster areas; secure rigidly in place.
 - 1. Install weep screeds at foundation. Install minimum 4 inches above earth or 2 inches above paved areas.
 - 2. To allow moisture to escape from a portland cement plaster (stucco) assembly, no sealant shall be placed at the bottom of the plaster termination.
- L. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.
- M. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
- N. Place casing beads at terminations of plaster finish. Butt and align ends, cope or miter at corners. Secure rigidly in place, maximum 12 inches on centers..

- O. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.07 FIELD QUALITY CONTROL

- A. Inspection: Notify Architect minimum 2 days prior to scratch coat for inspection of all in-place lath and accessories.

3.08 TOLERANCES

- A. Install accessories to lines and levels.
- B. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.
- C. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement plastering.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Weather barrier under exterior plaster.
- B. Section 08 31 00 - Access Doors and Panels: Access panels.
- C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum Sheathing: Solid backing at all exterior plaster.
- D. Section 09 22 36 - Lath: Lath, furring, beads, screeds, and joint accessories for plaster base.
- E. Section 09 91 13 - Exterior Painting: Finish paint over integral color plaster.

1.03 REFERENCE STANDARDS

- A. ASTM C150/C150M - Standard Specification for Portland Cement.
- B. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- C. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
- D. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- F. CBC - California Building Code.
- G. TSIB (PAM) - Plaster Assemblies Manual, Technical Services Information Bureau.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Evaluation Service Reports: Show compliance with specified requirements.
- D. Samples:
 - 1. Submit two samples, 8 by 8 inch in size illustrating finish color and texture.
 - 2. Submit two samples of each type trim accessory.
- E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 MOCK-UP

- A. Mock-Up Panel: Construct a 4 foot wide by 8 foot high sample panel of plaster work at the jobsite demonstrating installation procedures, finish texture, and color. Show each phase of installation including framing and reinforcement.
- B. After color and texture samples have been approved and returned, construct a mock-up not less than as noted above in size, of each texture type, in location approved by Architect.
 - 1. Use workmen, equipment and techniques proposed for use on the project.
 - 2. The panel may be constructed as a portion of the finished work, provided the approved panel is clearly identified for future reference.
 - 3. The approved panel shall become the standard of comparison for cement plaster work for the project.
 - 4. If mock-up is not a part of building construction, it must be removed when directed by Architect after completion of project.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
 - 1. Plaster Type: Factory prepared plaster mix.
 - 2. Number of Coats: Three.
 - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
 - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
 - 5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
 - 6. Finish: Acrylic.
- B. Solid Plaster Base: Concrete masonry.
 - 1. Plaster Type: Factory prepared plaster mix.
 - 2. Number of Coats: One.
 - 3. Finish: Acrylic.

2.02 FACTORY PREPARED CEMENT PLASTER

- A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:
 - 1. CBC, Section 2504.2.1 Wood furring strips (DSA & OSHPD 1& 4), 2507 Lathing and Plastering, 2511 Interior Plaster, and 2512 Exterior Plaster.

- B. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
 - 1. Provide continuous exterior insulation, with drainage grooves, as part of the system, by the same manufacturer.
 - a. See Technical Bulletin 60.110, TSIB (PAM).
 - 2. Provide weather resistive barrier as part of the system.
 - 3. Manufacturers:
 - a. BASF Wall Systems: www.wallsystems.basf.com/#sle.
 - b. Dryvit; Commercial Cement Plaster (CCP) 4: www.dryvit.com.
 - c. LaHabra; FastWall 300: www.lahabrastucco.com/#sle.
 - d. Omega Products International, Inc.; Super Cement with Crack Isolation System: omega-products.com.
 - e. Parex USA, Inc; Armourwall 300: www.parexusa.com/#sle.
 - f. Sto Corp; Sto Powerwall: www.stocorp.com/#sle.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Premixed One-Coat Base: Mixture of Type I Portland cement complying with ASTM C150/C150M, hydrated lime complying with ASTM C207, fibers and other approved ingredients; install in accordance with ASTM C926.
 - 1. Manufacturers:
 - a. Omega Products International, Inc.; Diamond Wall Insulating One Coat System: omega-products.com.
- D. Premixed Base Coats: Mixture of cement, aggregate, fibers, and proprietary admixtures for scratch and brown coats; install in accordance with ASTM C926.
- E. Premixed Leveling Coat: Acrylic polymer-based blend approved for use with plaster manufacturer's base coat and finish materials.
- F. Primer: Acrylic, as recommended by coating manufacturer and compatible with plaster base coat.
- G. Premixed Textured Coating: Polymer modified acrylic coating, integrally colored, and trowel applied to substrates prepared in accordance with manufacturer's written installation instructions.

2.03 ACCESSORIES

- A. Lath: See Section 09 22 36.
- B. Finishing Accessories: See Section 09 22 36.
- C. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.
- D. Reinforcing Mesh: 4.5 oz/sq yd alkali-resistant mesh.
- E. Water Resistive Barrier: See Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

- A. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

3.03 MIXING

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

3.04 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
 - 1. Apply base coat(s) to fully embed lath and to specified thickness.
 - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling Coat:
 - 1. Apply leveling coat to specified thickness.
 - 2. Fully embed reinforcing mesh in leveling coat.
- D. Finish Coats:
 - 1. Cement Plaster:
 - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
 - b. Apply desired surface texture while mix is still workable.
 - c. Float to a consistent finish.
 - 2. Primer and Acrylic Coatings:
 - a. Remove surface contaminants such as dust and dirt without damaging substrate.
 - b. Apply primer in accordance with manufacturer's instructions.
 - c. Apply finish coating in number of coats and to thickness recommended by manufacturer.
 - d. Finish coat to match existing texture.

- E. Finish Painting Overcoat: See Section 09 91 13 - Exterior Painting.

3.05 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.06 REPAIR

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

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications. T-1, G-1
- B. Tile for wall applications. T-2 through T-6, G-2
- C. Cementitious backer board as tile substrate.
- D. Ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- C. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- D. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
- E. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.
- F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
- G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

- M. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.
- N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.
- P. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
- Q. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- R. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
- S. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.
- T. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
- U. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile.
- V. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- W. ANSI/NFSI B101.3 - Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials.
- X. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.
- Y. ASTM C847 - Standard Specification for Metal Lath.
- Z. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- AA. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products.
- AB. SCAQMD 1168 - Adhesive and Sealant Applications.
- AC. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.
 - 1. Prior to shipment of tile to jobsite, deliver Master Grade Certificates to Architect, complying with TCNA/ANSI A137.1.
- G. Installer's Qualification Statement:
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. Extra Tile: One box, minimum of 24 pieces of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

- A. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
 - 1. Minimum size of mock-up is indicated on drawings.
 - 2. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Requirements for Persons with Disabilities: Provide ceramic tile flooring meeting slip-resistant requirements of California Code of Regulations (CCR), Title 24, Part 2, Chapter 11B and ADA Standards, latest amendment.
 - 1. Tile flooring surface shall be stable, firm, and slip resistant. CBC Section 11B-302.1 General.
 - 2. Tile flooring Surface shall demonstrate a dynamic coefficient of friction of at least 0.42 wet per DCOF AcuTest ANSI A137.1 Section 9.6 and ANSI/NFSI B101.3(using a BOT-3000 testing unit) will be accepted as meeting the intent of slip resistance; CBC 11B-302 Floor or Ground Surfaces and ADA Standards.
 - a. Ramp surface: Provide wet DCOF value of 0.46.
- B. California Plumbing Code:
 - 1. Floor Drains:
 - a. Inspection of Work - All surfaces prepared by others shall be inspected by the tile installer before starting tile work and all unsatisfactory conditions reported to the Administrative Authority. Starting tile work by the tile installer shall be considered as acceptance of surfaces prepared by others.
 - b. Surfaces - All surfaces to receive tile work shall be clean, structurally sound, and slopes shall to conform to CBC.
Note: No tile work shall proceed until the pan and drain construction has been inspected and approved by the Administrative Authority, where required.
 - 2. Definition:
 - a. Receptor: An approved plumbing fixture or device of such material, shape, and capacity as to adequately receive the discharge from indirect waste pipes, so constructed and located as to be readily cleaned. CPC 220.0

2.02 TILE

- A. Manufacturers:
 - 1. American Olean Corporation: www.americanolean.com/#sle.
 - 2. Dal-Tile Corporation: www.daltile.com/#sle.
- B. Glazed Wall Tile: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 - 2. Size: As indicated on Drawings, nominal.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: High gloss.
 - 5. Color(s): To be selected by Architect from manufacturer's standard range.
 - 6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.
- C. Porcelain Tile: ANSI A137.1, standard grade.

1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size: as indicated on Drawings, nominal.
3. Thickness: 3/8 inch.
4. Edges: Cushioned.
5. Surface Finish: Unglazed.
 - a. Dynamic Wet Slip Resistance DCOF AcuTest: 0.42
6. Color(s): To be selected by Architect from manufacturer's standard range.
7. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.

2.03 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
 1. Applications:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 - c. Floor to Wall Joints: Cove base.
 2. Manufacturers: Same as for tile.
- B. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
 1. Thickness: 1/2 inch.
 2. Material: Solid surface acrylic resin, mineral filler, and pigments; non-porous, color and pattern consistent throughout thickness.
 - a. Solid Polymer Fabricated: ASTM D638.
 - b. Color and Pattern: As indicated on drawings.
 - c. Manufacturers:
 - 1) Formica Corporation Product: Signatures: www.formica.com.
 - 2) Avonite Surfaces Product Avonite: www.avonitesurfaces.com.
 - 3) Dupont Product: Corian: www.corian.com.
 - 4) Panolam Industries International, Inc.(Nevamar); Product Fountainhead: www.nevamar.com.
 - 5) Wilsonart International, Inc Product: Gibraltar: www.wilsonart.com.
 3. Color and Pattern: As indicated on drawings.
 4. Applications:
 - a. At doorways where tile terminates.

2.04 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Interior adhesives, sealants, primers and sealants used as filler must meet the requirements of low emitting materials. Conform to SCAQMD 1168 and BAAQMD 8-51.
- C. Manufacturers:

1. Custom Building Products: www.custombuildingproducts.com/#sle.
 2. LATICRETE International, Inc: www.laticrete.com/#sle.
 3. Mapei Corporation: www.mapei.com.
 4. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
1. Applications: Where indicated on drawings.
 2. Products:
 - a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
 - c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
- E. Organic Adhesive: ANSI A136.1, thinset mastic type.
1. Use Type I in areas subject to prolonged moisture exposure.
 2. Products:
 - a. ARDEX Engineered Cements; ARDEX D14: www.ardexamericas.com/#sle.
 - b. Custom Building Products; ReliaBond Ceramic Tile Adhesive - Type 1: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE 15 Premium Mastic: www.laticrete.com/#sle.
 - d. MAPEI Corporation; Type 1: www.mapei.com.
 - e. Merkrete, by Parex USA, Inc; Merkrete Merstik: www.merkrete.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.
1. Products:
 - a. ARDEX Engineered Cements; A 38: www.ardexamericas.com/#sle.
 - b. Custom Building Products; ProLite Tile & Stone Mortar: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; LATICRETE 3701 Fortified Mortar Bed: www.laticrete.com/#sle.
 - d. Merkrete, by Parex USA, Inc; Merkrete Underlay C: www.merkrete.com/#sle.
 - e. Proflex Products, Inc; MSI - Mud Set Installation: www.proflex.us/#sle.
 - f. QuikCrete; 4:1 Deck Mud: www.custombuildingproducts.com

2.05 GROUTS

- A. Manufacturers:
1. Basis of Design: Custom Building Products: www.custombuildingproducts.com/#sle.
 2. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 3. Bonsal American, Inc; ProSpec Sanded Tile Grout 700: www.prospec.com

4. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 5. MAPEI Corporation: www.mapei.com.
 6. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Color Grout: www.merkrete.com/#sle.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated on exterior over plaster.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
 4. Products:
 - a. Basis of Design: Custom Building Products; Fusion Pro Single Component Grout: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 - c. Mapei, Inc.; Keracolor S Grout unsanded: www.mapei.com
 - d. Merkrete, by Parex USA, Inc; Merkrete Pro Grout: www.merkrete.com/#sle.
- C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Toilet room floors.
 2. Color(s): As selected by Architect from manufacturer's full line.
 3. Products:
 - a. Basis of Design: Custom Building Products; CEG-Lite 100% Solids Commercial Epoxy Grout: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
 - c. MAPEI Corporation; Kerapoxy Epoxy Grout: www.mapei.com.
 - d. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
- D. Stain Resistant Grout Additive: Liquid admixture for sanded and unsanded cement-based grouts; mix with dry grout material in place of water.
1. Applications: Toilet room floors.

2.06 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
 2. Color(s): As selected by Architect from manufacturer's full line.
 3. Products:
 - a. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
 - c. MAPEI Corporation; Mapesil Silicone Sealant: www.mapei.com.

- d. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking: www.merkrete.com/#sle.
- B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 - 1. Composition: Water-based colorless silicone.
 - 2. Products:
 - a. Specified Manufacturer: Aqua-Mix: www.custombuildingproducts.com; local representative Dale Roberts (951) 255-0243.
 - b. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer: www.merkrete.com/#sle.
- C. Tile Sealer: Stain protection for ceramic tile and natural stone tile.
 - 1. Products:
 - a. Custom Building Products; Aqua Mix Enrich 'N' Seal: www.custombuildingproducts.com/#sle.
 - b. STONETECH, a division of LATICRETE international, Inc; STONETECH Heavy Duty Stone Sealer: www.laticrete.com/#sle.
- D. Grout Release: Temporary, water-soluble pre-grout coating.
 - 1. Products:
 - a. Custom Building Products; Aqua Mix Grout Release: www.custombuildingproducts.com/#sle.

2.07 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 - 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
 - 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 20 mils, maximum.
 - c. Products:
 - 1) Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane: www.custombuildingproducts.com.
 - 2) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.
 - 3) MAPEI Corporation; Mapelastic HPG w/Fiberglass Mesh: www.mapei.com.
 - 4) Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: www.merkrete.com/#sle.
- B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 - 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 - 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:

- 1) Custom Building Products; RedGuard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
 - 2) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
 - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 4) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.
- C. Reinforcing Mesh: 2 by 2 inch size weave of 16/16 wire size; welded fabric, galvanized.
- D. Membrane at Walls:
1. Material: No. 15 asphalt saturated felt.
- E. Metal Lath: ASTM C847, Flat diamond mesh, of weight to suit application, galvanized finish.
- F. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
1. Products:
 - a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
- G. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 REGULATORY REQUIREMENTS FOR INSTALLATION

- A. California Plumbing Code:
1. Floor Drains:
 - a. Floors shall be sloped maximum 2% to drains. CPC 411.4.

3.02 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
1. Walls and floors to be level, plumb and true to within the listed for each applicable TCNA (HB) assembly method used.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.
- E. Verify that required floor-mounted utilities are in correct location.

3.03 PREPARATION

- A. Protect surrounding work from damage.
- B. Shade work from direct sunlight during tile installation as needed to prevent rapid evaporation caused by excessive heat.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.04 INSTALLATION - GENERAL

- A. Waterproof/Anti-Fracture Membrane Application: Comply with manufacturer's written instructions and recommendations for substrate, tile setting method and Project conditions.
- B. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
- C. Expansion Joints: Provide expansion joints at locations and spacings as recommended by TCNA (HB) Detail EJ171 and as indicated on Drawings. Keep joints free of setting bed mix and grout.
- D. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- G. Form internal angles square and external angles bullnosed.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep control and expansion joints free of mortar, grout, and adhesive.
- K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.
- B. Cleavage Membrane: Lap edges and ends.

- C. Waterproofing Membrane: Install as recommended by manufacturer .
- D. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.

3.06 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

3.07 GROUTING

- A. Joint Width: As follows unless indicated otherwise on Drawings.
 - 1. Glazed Wall Tile, Unmounted: As determined by spacing lugs.
 - 2. Glazed Floor Tile, Unmounted: 1/8 inch.
 - 3. Porcelain Floor Tile: 1/4 inch.
 - 4. Mounted Tile: As determined by factory-produced spacing.
 - 5. Trim and Accessories: Match adjoining tile units.
- B. Wall Tile Grouting: TCNA/ANSI A108.10, latex-portland cement.
- C. Floor Tile Grouting: TCNA/ANSI A108.10, latex-portland cement.
- D. Do not begin grouting tiles until they are firmly set and a minimum of 48 hours of curing has occurred.
- E. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
- F. When using proprietary grout, comply with manufacturer's instructions and recommendations unless otherwise more stringent requirements are specified.
- G. Force maximum amount of approved grout into joints in accordance with pertinent recommendations contained in TCNA/ANSI A108.10.
- H. Fill joints of cushion-edge tile to depth of cushion; fill joints of square-edge tile flush with tile surface.
- I. Fill all gaps and skips.
- J. Do not permit mortar or mounting mesh to show through grouted joints.
- K. Provide hard finished grout which is uniform in color, smooth, and without voids, pin holes, or low spots.
- L. Leave tile clean.

3.08 TOLERANCES

- A. Subsurface Guidelines: Refer to TCNA (HB) for a complete guidelines.

Mortar Bed	1/4 inch: 10 feet
Thin Bed w/ cementitious bonding material w/ Tiles <15"	1/4 inch: 10 feet from plane Maximum 1/16 inch variation in 12 inches from high points.
Thin Bed w/ cementitious bonding material w/ Tiles any side >15"	1/8 inch: 10 feet from plane Maximum 1/16 inch variation in 24 inches from high points.

Thin Bed w/ organic adhesive bonding material w/ Tiles any side >15"	1/16 inch in 3 feet No abrupt irregularities >1/32 inch

- B. Lippage Guidelines: Refer to TCNA (HB) for a complete guidelines.

Tile Type	Tile Size (in.)	Joint Width (in.)	Allowable Lippage (in.)
Glazed Wall/ Mosaics	1 x 1 to 6 x 6	1/16 to 1/8	1/32
Quarry	6 x 6 to 8 x 8	1/4 or greater	1/16
Pressed Floor and Porcelain Tiles	All	1/16 to less than 1/4	1/32
Pressed Floor and Porcelain Tiles	All	1/4 or greater	1/16

3.09 JOINT SEALANT

- A. Apply sealant after tile is grouted, grout is cured and tile field is thoroughly clean and dry.
- B. Seal between tile and all penetrating elements.
- C. Seal perimeter of tile field where tile base is not provided.
- D. Sealant Locations shall include:
 - 1. Around plumbing penetrations.
 - 2. Around door frames and other items set in wall.
- E. Refer to Section 07 92 00 - Joint Sealants for additional requirements.

3.10 GROUT SEALER

- A. Clean grout and apply sealer in accordance with manufacturer's instructions and recommendations.

3.11 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide manufacturer's field representative to inspect waterproofing.
- C. Test shower linings with standing water to the top of the rough threshold for a period of minimum 24 hours. CPC 418.1.
 - 1. A test plug shall be so placed that both the upper and under sides of the lining shall be subjected to test at its point of contact with the sub-drain.
 - a. When the test plug is removed, all of the test water shall drain out by gravity through the weep holes.
 - b. A ring of non-absorbent material must be placed around the weep holes to keep them open when the finish materials are installed.
 - 2. Verify water level has not changed beyond normal evaporation.
 - 3. Inspect floor below and adjacent surfaces for leaks.
- D. Repair or remove and reinstall as required.

- E. Repeat until a satisfactory result is achieved.

3.12 CLEANING

- A. Clean tile and grout surfaces.

3.13 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units. ACT-1

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 21 00 - Thermal Insulation: Acoustical insulation.
- C. Section 08 31 00 - Access Doors and Panels: Access panels.
- D. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC) - Air Outlets and Inlets: Air diffusion devices in ceiling.
- E. Division 26 - Electrical - Interior Lighting: Light fixtures in ceiling system.
- F. Division 27 - Communications - Public Address Systems: Speakers in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- G. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- H. CHPS (HPPD) - High Performance Products Database.
- I. UL (GGG) - GREENGUARD Gold Certified Products.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Evaluation Service Reports: Show compliance with specified requirements.
 - 1. Submit copies of the suspension system manufacturer's current ICC Evaluation Service Report.
- E. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.
- F. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Manufacturer's Qualification Statement.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 1.0 percent of amount installed.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - a. Local contacts Dai-Nee Tan 949-275-8169 or Tim Traber 760-473-1108.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. USG Corporation: www.usg.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 - 1. Same as for acoustical units.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Flame Spread Rating: Provide acoustical ceiling units bearing the label of Underwriters' Laboratories, or other testing agency acceptable to the State Fire Marshal, indicating that the units provide the specified flame spread rating.
 - 1. Class A Flame spread rating 0-15, smoke developed 0-15 per ASTM E84 for each acoustical tile type.
- B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
 - 1. Local authorities having jurisdiction.
 - 2. ICC-ES Evaluation Report No. ESR-1308.
 - 3. Seismic Requirements: Furnish and install suspension systems in accordance with the suspension system manufacturer's current ICC Evaluation Service Report; the California Building Code (CBC), Title 24 Part 2, Section 1616A.1.21; CBC Title 24 Part 2, Chapter 25.
 - a. Include the following Interpretation of Regulations, issued by the Division of the State Architect (DSA).
 - 1) IR A-5: Acceptance of Products, Materials, and Evaluation Reports; Revised 1/27/17.
 - 2) IR 16-9: Pendant Mounted Light Fixtures; Revised 11/3/10.
 - 3) IR 25-2.13: Metal Suspension Systems for Lay-In Panel Ceilings; Revised 11/9/17.
 - 4) IR 25-1: Maximum Allowable Load for 10 Gage and 12 Gage Wires; Revised 9/23/10.

2.03 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: Certified as Low Emission by one of the following:
 - a. Product listing in UL (GGG).
 - b. Product listing in CHPS (HPPD).
- B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - b. Pattern: "C" - perforated, small holes.
 - 2. Size: 24 by 48 inch.
 - 3. Thickness: 3/4 inch.
 - 4. Light Reflectance: 85 percent, determined in accordance with ASTM E1264.
 - 5. NRC Range: 0.55, determined in accordance with ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 7. Panel Edge: Reveal.
 - 8. Tile Edge: Beveled.
 - a. Joint: Kerfed and rabbeted.

9. Suspension System: Exposed grid.
10. Basis of Design Product: School Zone Fine Fissured No. 1824 as manufactured by Armstrong World Industries, or equal.

2.04 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System, Type TBAR-1: Hot-dipped galvanized steel grid with cap.
 1. Application(s): Seismic.
 2. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 3. Profile: Tee; 15/16 inch face width.
 4. Finish: Baked enamel.
 5. Color: White, unless noted otherwise.
 6. Basis of Design Product: Prelude XL 7301 main runners; FastSize; XL7341, XL7340, XL7342, and XL7328 cross runners - ICC ESR 1308 as manufactured by Armstrong World Industries, or equal.

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
 1. Conform to seismic requirements indicated in the ESR approval documents.
- E. Perimeter Moldings: Same metal and finish as grid.
 1. Size: As required for installation conditions and specified Seismic Design Category.
 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.

1. Complete and obtain approval of mechanical, electrical and other work above the ceiling line, before start of acoustical ceiling installation.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
 1. Conform to DSA IR 25-2.13 Metal Suspension Systems for Lay-In Panel Ceilings.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 1. Use longest practical lengths.
- E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 1. Cut to fit irregular grid and perimeter edge trim.
 2. Make field cut edges of same profile as factory edges.
 3. Double cut and field paint exposed reveal edges.
- F. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

- B. Coordination of Other Tests and Inspections: District will employ independent testing agency to test and/or inspect anchors; provide access and assistance as required to accommodate timely performance.
- C. Testing (per DSA IR 25-2.13): All field testing must be performed in the presence of the project inspector or a special inspector.
 - 1. New Installations:
 - a. Post-installed anchors in concrete used to support hanger wires shall be tested at a frequency of 10 percent.
 - 1) Power actuated fasteners in concrete shall be field tested for 200 lbs. in tension. All other post-installed anchors in concrete shall be tested in accordance with CBC Section 1910A.5.
 - b. Post-installed anchors in concrete used to attach bracing wires shall be tested at a frequency of 50 percent in accordance with CBC Section 1910A.5.
 - 2. Re-Use of Existing Ceiling Hanger Wires and Bracing Wires:
 - a. All existing ceiling hanger wire/anchor assemblies must be tested to 200 lbs.
 - b. All existing bracing wire/anchor assemblies must be field tested to 440 lbs.
 - c. Where a new wire is spliced to an existing wire, each spliced wire/anchor assembly must be field tested to the loads given for existing assemblies above.

3.06 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.07 ADJUSTING AND CLEANING

- A. Replace loose and damaged tile and panels when directed.
- B. Touch-up all damaged finish.
- C. Leave all surfaces clean and free from markings and other disfigurements.
- D. Remove all debris resulting from the work of this section.

END OF SECTION

SECTION 09 65 00 RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring. RF-1, RF-2, RF-3, RF-4
- B. Resilient base. RB-1
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- D. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base.
- E. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- G. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, 2 by 2 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- J. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 100 square feet of each type and color.
 - 3. Extra Wall Base: 50 linear feet of each type and color.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.07 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Provide products complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
- B. Requirements for Physically Disabled: Provide flooring meeting slip-resistant requirements of California Code of Regulations (CCR), Title 24, Part 2, Chapter 11B and ADA Standards, latest amendment.
 - 1. Flooring surface shall be stable, firm, and slip resistant. CBC Section 11B-302.1 General.
 - 2. Flooring surface shall demonstrate a dynamic coefficient of friction of at least 0.42 per DCOF AcuTest ANSI 137.1 Section 9.6 and ANSI B101.3 (using a BOT-3000 testing unit)

will be accepted as meeting the intent of slip resistance; CBC 11B-302 Floor or Ground Surfaces and ADA Standards.

- a. Ramp surface: Provide DCOF value of 0.46.
- C. Comply with CalGreen Building Standards: 80 percent of the installed resilient flooring shall meet one of the following:
 1. VOC Content: Certified as Low Emission by one of the following :
 - a. SCS Floorscore; www.scs-certified.com. CalGreen 5.504.4.6.1.
 - b. Compliant with the VOC emission limits and testing requirements specified in the California Department of Public Health's 2010 "Standard Method for the Testing and Evaluation Chambers", Version 1.1, February 2010. CalGreen 5.504.4.6.2.
 - c. Compliant with the Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Product Database; www.chps.net/manual/lem_table.htm. CalGreen 5.504.4.6.3.
 - d. Products certified under UL GreenGuard Gold; www.greenguard.org. CalGreen 5.504.4.6.4.

2.02 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Comply with ANSI / NSF 332.

2.03 SHEET FLOORING

- A. Linoleum Sheet Flooring - Type RF-1, RF-2, RF-3, RF-4: Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness.
 1. Basis of Design Product: Marmoleum Concrete and Piano as manufactured by Forbo Flooring Systems, or approved equal.
 2. Manufacturers:
 - a. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - b. Forbo Flooring, Inc: www.forboflooringna.com/#sle.
 - c. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 3. Minimum Requirements: Comply with ASTM F2034, Type corresponding to type specified.
 4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 5. VOC Content Limits: As specified in Section 01 61 16.
 6. Backing: Jute fabric.
 7. Thickness: 0.100 inch, minimum, excluding backing.
 8. Sheet Width: 79 inch, minimum.
 9. Seams: Heat welded.
 10. Color: As indicated on drawings.
- B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.04 RESILIENT BASE

- A. Resilient Base - Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style A, Straight.
 - 1. Manufacturers:
 - a. Armstrong; Wall Base: www.armstrongflooring.com.
 - b. Burke Flooring: www.burkeflooring.com/#sle.
 - c. Johnsonite, a Tarkett Company: www.johnsonite.com.
 - d. Roppe Corp: www.roppe.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Height: 4 inch.
 - 4. Thickness: 0.125 inch.
 - 5. Finish: Satin.
 - 6. Length: 4 foot sections.
 - 7. Color: As indicated on drawings.
 - 8. Accessories: Premolded external corners and internal corners.

2.05 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
 - 1. VOC Content Limits: As specified in Section 01 61 16.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- C. Environmental Condition: Comply with flooring manufacturer's instructions and recommendations.

1. Verify that ambient and surface temperatures and humidity conditions are in compliance.
- D. Verify that required floor-mounted utilities are in correct location.
- E. Material Inspection:
 1. In accordance with manufacturer's installation requirements, visually inspect materials prior to installation.
 2. Material with visual defects shall not be installed.
 3. Labor costs required to replace material installed with visual defects shall be the responsibility of the installation contractor.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions. Beginning of installation means acceptance of existing substrate and site conditions and assumes responsibility for correcting unsuitable conditions at no additional cost to the District.
- B. Install in accordance with manufacturer's written instructions.
 1. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- C. Adhesive-Applied Installation:
 1. Spread only enough adhesive to permit installation of materials before initial set.
 2. Fit joints and butt seams tightly.
 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- F. Install feature strips where indicated.

3.04 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Seams are prohibited in kitchens and custodial closets.
- C. Seal seams by heat welding where indicated.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Services: Upon District's request and with at least 72 hours notice, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.07 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.
- C. Installation Clean-Up: Upon completion of installation in a room or area, clean flooring and adjacent surfaces.
 - 1. Sweep or vacuum floor thoroughly.
 - 2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
 - 3. Remove excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.
- D. Initial Cleaning: After adhesive has set but no sooner than 5 days after installation, wash resilient tile flooring with a neutral type cleaning solution in accordance with manufacturer's instructions and recommendations. Rinse thoroughly with clear, cool water but do not flood floor.
 - 1. After completion of installation, apply one coat of polish, if recommended by manufacturer, and buff to even luster.
 - 2. After final cleaning, apply second coat of polish as recommended by tile manufacturer and buff to even luster.
- E. Final Cleaning: Thoroughly clean resilient tile flooring and accessories in accordance with final cleaning specified in Section 01 70 00 - Execution and Closeout Requirements.
 - 1. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of Project.
 - 2. Clean resilient flooring by method recommended by resilient flooring manufacturer, including stripping and application of additional floor polish and buffing to even luster.

3.08 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. From the time of laying until Acceptance, protect flooring from damage.
 - 1. Lay reinforced kraft paper runners and provide barricades and signs as necessary to prevent construction traffic on completed installations.

2. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.
3. Remove and replace defects which develop such as damaged, loose or broken tile and resilient accessories.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered. CPT-1, CPT-2, CPT-3, CPT-4, CPT-5
- B. Removal of existing carpet/tile.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.
- C. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- D. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- E. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- F. Section 09 6500 - Resilient Flooring: Topset Base.

1.03 REFERENCE STANDARDS

- A. AATCC Test Method 134 - Electrostatic Propensity of Carpets.
- B. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
- C. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- D. CRI 104 - Standard for Installation of Commercial Carpet.
- E. CRI (GLP) - Green Label Plus Testing Program - Certified Products.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Submit two, 6 inch long samples of edge strip and base cap.
- F. Manufacturer's Installation Instructions: Indicate special procedures.

- G. Installer's Qualification Statement.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
 - 1. Store inside, in well ventilated area, protected from weather, moisture and soiling. Store rolls flat, not standing on end.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Deliver carpet materials in original mill protective wrapping with mill register numbers and tags attached.
- D. Ventilate installation area during installation and for 72 hours after installation.

1.07 WARRANTY

- A. Carpet Warranty: Provide 10-year Commercial Limited Warranty.
- B. Extended Warranty: Provide extended warranty covering edge raveling, delamination and wear exceeding 10 percent of face yarn weight for a period of 15 years after "Notice of Completion".

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. All products used for flooring installation shall comply with flammability and smoke classifications for various locations of installation. Comply with applicable requirements of California Building Code (CBC) Chapter 8.
- B. Provide glue-down installation conforming to CBC Section 11B-302.2.
 - 1. Carpet shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad.
 - a. Carpet shall have level loop, textured loop, level cut or level cut/uncut pile texture.
 - b. Pile height shall be 1/2 inch maximum.

2. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length.
 - a. Carpet edges shall comply with CBC Section 11B-303.
- C. Comply with CalGreen Building Standards: All installed carpeting shall be low VOC emissions listed. Certified as Low Emission by one of the following:
 1. Carpet and Rug Institute's Green Label Plus Program. CalGreen 5.504.4.4.1
 2. Compliant with the VOC emission limits and testing requirements specified in the California Department of Public Health's "Standard Method for the Testing and Evaluation Chambers", Version 1.1, February 2010 or Specification 01350. CalGreen 5.504.4.4.2.
 3. NSF/ANSI 140 at Gold level or higher. CalGreen 5.504.4.4.3
 4. SCS Floorscore; www.scs-certified.com. CalGreen 5.504.4.4.4.
 5. Compliant with the Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Product Database; www.chps.net/manual/lem_table.htm. CalGreen 5.504.4.4.5.

2.02 MATERIALS

- A. Tile Carpeting, Type CPT-1: Tufted, Textured Loop, manufactured in one color dye lot.
 1. Product: As indicated on Drawings manufactured by Shaw Contract.
 2. CPT-1 Tile Size: 9 by 36 inch, nominal.
 3. CPT-2, CPT-3, CPT-4, CPT-5 Tile Size: 24 by 24 inch, nominal.
 4. CPT-1 Thickness: 0.208 inch.
 5. CPT-2, CPT-3, CPT-4 Thickness: 0.263 inch.
 6. CPT-5 Thickness: 0.281 inch.
 7. Color: As indicated on Drawings.
 8. Pattern: Linear.
 9. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 10. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 11. VOC Content: Comply with Section 01 61 16.
 12. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
 13. Antimicrobial: Yes.
 14. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity, AATCC Test Method 134.
 15. Primary Backing Material: PVC-Free.
- B. Tile Carpeting, Type CPT-3: Tufted, Textured Loop, manufactured in one color dye lot.
 1. Product: Mix of Formation 11251 Mineraloid 60%, Formation Transiton 11252 40%, "Mineraloid/Caeruleus" 58227 manufactured by Tarkett North America.

2. Tile Size: 24 by 24 inch, nominal.
 3. Thickness: 0.35 inch.
 4. Color: As indicated on Drawings.
 5. Pattern: Geometric.
 6. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 7. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 8. VOC Content: Comply with Section 01 61 16.
 9. Indoor Air Quality—CRI Green Label Plus™
 10. Antimicrobial: Yes.
 11. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity, AATCC Test Method 134.
 12. Gage: 1/10 inch.
 13. Stitches: 9.6 per inch.
- C. Tile Carpeting, Type CPT-4: Tufted, Textured Loop, manufactured in one color dye lot.
1. Product: Abrasive Acton II 02578 manufactured by Tarkett North America.
 2. Tile Size: 24 by 24 inch, nominal.
 3. Thickness: 0.35 inch.
 4. Color: As indicated on Drawings.
 5. Pattern: Geometric.
 6. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 7. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 8. VOC Content: Comply with Section 01 61 16.
 9. Indoor Air Quality—CRI Green Label Plus™
 10. Antimicrobial: Yes.
 11. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity, AATCC Test Method 134.
 12. Gage: 1/12 inch.
 13. Stitches: 8 per inch.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, color as selected by Architect.
- C. Adhesives:
 1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

1. Water-resistant, non-staining and nonflammable type as recommended by carpet manufacturer to be compatible with backing materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
 1. Maximum variation of 1/8-inch in 10 ft
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.
- D. Carpet Verification: Verify carpet match before cutting or placement to ensure minimal variation between dye lots.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove existing carpet tile.
- B. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
 1. Locate change of color or pattern between rooms under door centerline.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
 1. Edges: Run carpet under open bottom items and all cabinets and install tight to walls. Neatly trim and secure edge of carpet adjacent to door jambs where no base occurs.
- I. Complete installation of edge strips, concealing exposed edges.

- J. Carpet Finishing: Brush all seams and trim protruding pile tufts level. Remove excess adhesive on the carpet surface and thoroughly vacuum entire area. Leave room clean and ready for use.

3.04 PROTECTION

- A. Cover carpet during construction period with reinforced kraft paper when construction traffic is required to cross carpeted areas.
- B. Remove and replace damaged or improperly installed carpet.

3.05 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.
 - 1. Vacuum and remove all stains from carpet to satisfaction of District and in accordance with cleaning specified in Section 01 70 00 - Execution and Closeout Requirements.

END OF SECTION

SECTION 09 72 00

WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation and prime painting.
- B. Wall covering.
 - 1. Digital Print Wall Covering

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit six samples of wall covering, 6 by 9 inch in size illustrating color, finish, and texture.
- E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- F. Manufacturer's Installation Instructions: Indicate special procedures.
- G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
- H. Installer's Qualification Statement.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
 - 3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.05 QUALITY ASSURANCE

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

1.06 MOCK-UP

- A. Provide panel, 3 panel drops wide, full height, illustrating installed wall covering and joint seaming technique.
- B. Locate where directed.
- C. Mock-up may not remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering: Fabric-backed vinyl roll stock.
 - 1. Comply with ASTM F793/F793M, Category V, Type II.
 - 2. Backing: Woven, osnaburg fabric.
 - 3. Color: As indicated on Drawings.
 - 4. Overcoating: Manufacturer's standard coating for stain resistance.
 - 5. Manufacturers:
 - a. Koroseal/RJF International: www.koroseal.com.
 - 1) Local Representative: Scott Hewlett, (310) 633-1506.
 - b. MDC Wallcoverings: www.mdcwall.com.
 - c. Wolf-Gordon: www.wolfgordon.com.
 - d. Versa Wallcovering: www.versawallcovering.com
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Digital Print Wall Covering: Fabric-backed vinyl roll stock.

1. Basis of Design Product: Koroseal Digital Type II Vinyl as manufactured by Koroseal/RJF International, or approved equal.
 - a. Local Representative: Scott Hewlett, (310) 633-1506.
2. Conform to ASTM F793/F793M, Category V, Type II.
 - a. Comply with Federal Specification CCC-W408A and the CFFA-W-101-D, Quality Standard for Vinyl Coated Fabric Wallcovering
 - b. Mildew Inhibitors: Yes.
3. General: Graphic film and overlamine for inkjet printing with solvent, UV, latex inks and screen printing. For field applied application.
4. Graphics: Artwork provided by District.
5. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
6. Backing: Non-woven, synthetic fabric.
7. Overcoating: Manufacturer's standard coating for, factory applied 0.37 thick "Protected Film".
8. Manufacturers:
 - a. Koroseal/RJF International; Koroseal Digital Type II Vinyl: www.koroseal.com.
1) Local Representative: Scott Hewlett, (310) 633-1506.
 - b. MDC Wallcoverings: www.mdcwall.com.
 - c. Wolf-Gordon: www.wolfgordon.com.
 - d. Versa Wallcovering: www.versawallcovering.com
 - e. 3M Company - Commercial Solutions Division (CSD); Vinyl Graphic Wall Coverings: https://www.3m.com/3M/en_US/company-us/search/?Ntt=Vinyl+Graphic+Wall+Coverings .
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

- D. Inspect for any conditions detrimental to the proper and timely completion of the installation. Do not proceed with work until conditions have been corrected.

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
 - 1. Provide hanging surface that is smooth and free of all excess dust, oils or other foreign matter.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
- E. Marks: Seal with shellac those that may bleed through surface finishes.
- F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Use wall covering in roll number sequence.
- D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- F. Butt edges tightly.
- G. Horizontal seams are not acceptable.
- H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- J. Do not install wall covering more than 1/4 inch below top of resilient base.
- K. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- L. Apply wall covering to electrical, telephone, and communications wall plates prior to replacing.
- M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.
- N. Install termination trim.
- O. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

- B. Provide manufacturer's field representative to observe continuing installation.
- C. After the application of three sheets of wood wallcovering, request inspection by Architect for material quality and proper installation.

3.05 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.06 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

3.07 MAINTENANCE

- A. Submit a copy of maintenance instructions to District.

END OF SECTION

SECTION 09 72 16.26
ARCHITECTURAL VINYL GRAPHIC FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural Decorative Film. GF-1
- B. Graphic artwork cut pattern.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 20 00 - Finish Carpentry.
- C. Section 06 41 00 - Architectural Wood Casework.
- D. Section 08 11 13 - Hollow Metal Doors and Frames.
- E. Section 08 80 00 - Glazing.
- F. Section 09 21 16 - Gypsum Board Assemblies.
- G. Section 09 91 23 - Interior Painting: Preparation and priming of substrate surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each product to be used and adhesive.
- C. Shop Drawings:
 - 1. Submit shop drawings covering fabrication, installation and finish of specified systems.
 - 2. Include fully dimensioned plans and elevations with material coordination keys.
 - 3. Show artwork for each film item.
- D. Samples:
 - 1. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
 - 2. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
- E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- F. Manufacturer's Installation Instructions: Indicate special procedures.

- G. Specimen Warranty: Submit manufacturer's standard warranty document by authorized manufacturer.
- H. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces, including precautions against harmful cleaning materials and methods.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
 - 2. Provide a commercial building reference list of five (5) properties where the installer has applied film. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of substrate.
 - d. Type of film.
 - e. Amount of film installed.
 - f. Date of completion.
- C. Single-Source Responsibility: For each separate film graphic type required from one source of a single manufacturer.
- D. Graphic fabricator is responsible for the quality and materials and workmanship required for the execution of this contract including the materials and workmanship of any firms or individuals who act as his sub-contractors.
- E. Create artwork for specific items as noted on Drawings meet design intent; including final artwork for fabrication (including reproducible film positives).
- F. The graphic design requirements shown by the details Drawings show design intent only and intended to establish basic dimensions colors, shapes, profiles, sight lines, and appearance. Maintain visual design concept as shown, including sizes, shapes, colors, and placement as accurately as possible.

1.07 MOCK-UP

- A. Provide film mock-up, one complete area, illustrating installation for evaluation of surface preparation techniques and application workmanship.
- B. Locate where directed.
- C. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
- D. Refinish mock-up area as required to produce acceptable work.
- E. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- C. Product must remain in original plastic bag and boxes and have storage conditions as follows:
 - 1. 40°F (5°C) - 90°F (32°C) storage temperature range
 - 2. Out of Sunlight
 - 3. Clean dry area
 - 4. Original container
 - 5. Do not stack boxes over six (6) units high. Excessive weight can damage the film
 - 6. Products are not recommended for interior applications where condensation consistently occurs.
 - 7. Handle products in accordance with manufacturer's instructions.
 - 8. Total pre-installation shelf life: 2 years. Up to 2 years unprocessed, OR process within 1 year and apply within 1 year of processing.

1.09 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
 - 1. Apply materials when environmental conditions are continuously heated. Application temperature range is 60°F - 100°F (16°C - 38°C).
- D. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.
- C. Provide ten year manufacturer warranty for appearance and adhesion properties.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design - Vinyl Graphic Wall Coverings: 3M Company - Commercial Solutions Division [CSD]; : 1-888-650-3497.
- B. Other Acceptable Manufacturers - Wall Coverings:
 - 1. Graffiti Inc.: www.graffitiinc.com.
 - 2. Flexvue Films: www.flexvuefilms.com.
 - 3. Madico, Inc: www.madico.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.03 MATERIALS

- A. General: Printed and textured graphic film for factory or field applied application.
 - 1. Graphic film and overlamine for inkjet printing with solvent, UV, latex inks and screen printing. For field applied application.
 - a. Graphics: Artwork provided by District.
- B. Film: Image printed on vinyl; 2 mil thickness with luster finish.
 - 1. Base Film Basis of Design Product: 3M Print Wrap Film IJ180mC-10 as manufactured by 3M Company - Commercial Solutions Division CSD, or approved equal.
 - 2. Overlay Film Basis of Design Product: 3M Scotchcal, 8518 Gloss Overlamine as manufactured by 3M Company - Commercial Solutions Division CSD, or approved equal.
 - 3. Edge Sealer Basis of Design Product: Edge Sealer 3950 as manufactured by 3M Company - Commercial Solutions Division CSD, or approved equal.
- C. Decorative Pattern: Printed graphic image to be provided through the Architect.
- D. Adhesive: Acrylic, Pressure Sensitive.
 - 1. Basis of Design Product: Comply(TM) Adhesive with micro technology non-visible air release channels as manufactured by 3M Company - Commercial Solutions Division CSD, or approved equal.

2.04 FABRICATION

- A. Conform shop fabrication and tolerances for graphic artwork to the standards of the industry.
- B. Shop fabricated all item, so far as practicable.
- C. Perform high-quality, professional workmanship.
- D. Fabricate work to proper proportions, with orientation that will be straight, plumb, level and square and to sizes, shapes and profiles indicated on the approved shop drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify pattern prior to material acquisition.
- B. Verify that substrate surfaces are in compliance with requirements for non-porous, smooth surface, ready to receive work, and conform to requirements of the wall covering manufacturer.
 - 1. Responsibility for state of surfaces prior to installation to be pre-determined by an installation specialist.
 - 2. Reference Manufacturer's Technical Data Sheet to determine compatibility of finish to substrate
 - 3. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by film and adhesive manufacturer.
 - 4. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.
- C. Do not proceed with work until conditions have been corrected.
- D. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
 - 1. Ensure that the existing paint, surface finish, or wall covering has excellent bond to the substrate area where Product will be applied.
- C. Thoroughly clean substrate of substances that could impair the overlay's bond, including mold, mildew, oil, grease.
- D. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.
- E. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- F. Test and prepare application surfaces per manufacturer's instructions.
 - 1. Use the manufacturer's adhesion test to determine the compatibility of the application surface.
 - 2. Use the 3M™ Enhanced Cleaning Method to ensure that the application surface is ready to receive and hold the Product.

3.03 INSTALLATION

- A. Do not proceed with installation until all finishing work has been completed in and around the work area.

- B. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Install in accordance with manufacturer's instructions.
- D. Application must be performed by qualified installer.
- E. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- F. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- G. Apply smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.

3.04 CLEANING

- A. Use cleaning methods recommended by manufacturer for applicable environment.
- B. Clean film of excess adhesive, dust, dirt, and other contaminants.
- C. After application of film, wash film using common cleaning solutions, including ammonia solutions, 30 days after application.
 - 1. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film.
 - 2. Use synthetic sponges or soft cloths.
- D. Reinstall wall plates and accessories removed prior to work of this section.
- E. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- F. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 PROTECTION

- A. Protect completed graphic film during remainder of construction period.
- B. Do not permit construction activities at or near finished areas.

END OF SECTION

SECTION 09 72 60
RESILIENT TACKABLE WALL COVERING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Resilient cork/linoleum tackable wall covering (TWP-1 Thru TWP-4).
- B. Surface preparation and prime painting.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 91 23 - Interior Painting: Preparation and priming of substrate surfaces.
- C. Section 10 11 00 - Visual Display Units: Prefabricated, framed tackboards and markerboards.

1.03 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering.
- D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, 7 x 9 inch in size illustrating color, finish, and texture of each type of tackable wallcovering material required.
- E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- F. Manufacturer's Installation Instructions: Indicate special procedures.
- G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
 - 1. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.

1.05 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain tackable wallcovering system components from a single source.

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original factory packaging, labeled with manufacturer, brand name, size, color, and lot number.
- B. Inspect roll materials at arrival on site, to verify acceptability.
- C. Store materials in original, undamaged packaging inside a well-ventilated area protected from weather, moisture, soiling, and extreme temperatures.
- D. Protect packaged adhesive from temperature cycling and cold temperatures.
- E. Do not store roll goods on end.
- F. Maintain room temperature within the storage area at not less than 68 degrees Fahrenheit (20 degrees Celsius) during the period materials are stored

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
 - 1. Maintain ambient temperature within the building at not less than 68 degrees Fahrenheit (20 degrees Celsius) for a minimum of seventy-two hours prior to beginning of installation.
 - a. Do not install tackable wallcovering until the space is enclosed and weatherproof.
 - b. Do not install tackable wallcovering until temperature is stabilized and permanent lighting is in place.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

1.08 WARRANTY

- A. Submit manufacturer's limited five-year written warranty against manufacturing defects.-

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design Product: Bulletin Board as manufactured by Forbo, or approved equal.
- B. Other Acceptable Manufacturers:
 - 1. Forbo Flooring Systems; Bulletin Board: www.forboflooringna.com.
 - 2. Koroseal/RJF International; Walltalkers, Tac-Wall: www.koroseal.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PRODUCTS

- A. Product Description:
 - 1. Material: Homogeneous tackable surface material made of primary natural materials consisting of linseed oil, cork, rosin binders and dry pigments mixed and calendared onto a natural jute backing.
- B. Roll Width: 48 inch.
- C. Thickness (Gauge): 1/4 inch.
- D. Roll Length: Approximately $\pm$ 90-95 lineal foot rolls.
- E. Flexibility: Flexible enough to bend around a 2-3/4 inch radius.
- F. Color to extend through thickness of material.
 - 1. TWP-1 thru TWP-4 Color: As indicated on drawings.
- G. Mounting: Adhesive.
- H. Performance:
 - 1. Comply with ASTM F2034.
 - 2. Surface Burning Characteristics Classification: Provide materials that meet classification ratings below:
 - a. ASTM E84 / NFPA 255: Class II/B
 - 3. Thermal Conductivity: Coefficient of thermal conductivity is $\pm$ 0.10 W/m-K.
 - 4. Sound Testing:
 - a. Noise Reduction Coefficient (NRC) ASTM C423: 0.10.
 - b. Sound Absorption Average (SAA) ASTM C423: 0.09.
 - 5. Resistance to Bacteria: Independent testing has shown that a sterile zone around the material inhibits the growth of organisms such as staphylococcus aureas and Clostridium difficile.
 - 6. Anti-Static Properties: Naturally anti-static.
 - 7. Dimensional Stability: Resist cracking, drying, and peeling.
- I.

2.03 ACCESSORIES

- A. Adhesive: Solvent-free, SBR type linoleum adhesive or polyvinyl acetate dispersion type (contact adhesive) when used in a press.
- B. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- C. Substrate Primer and Sealer: Alkyd enamel type.
- D. Color matched caulk:
 - 1. To be selected by Architect from full range.
- E. Joints:
 - 1. Butt joint.
- F. Termination Trim: Extruded plastic, clear.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions in which tackable wallcoverings will be installed.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.
- D. Complete finishing operations, including painting, before beginning installation of tackable wallcovering materials.
 - 1. Verify that substrate surfaces are prime painted and ready to receive work, and conform to requirements of the wall covering manufacturer.
 - 2. Wall surfaces to receive wallcovering materials shall be dry and free from dirt, grease, loose paint, and scale.
 - 3. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.
 - 4. Beginning of installation means acceptance of surface conditions.

3.02 PREPARATION

- A. Surface Preparation: Remove hardware, accessories, plates, and similar items to allow tackable wallcovering to be installed.
- B. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
 - 1. Plaster surface: Remove surface chalk. In new work, use moisture meter to determine moisture content. Do not begin installation when moisture content is greater than five percent.
 - 2. Gypsum board surface: Recess nails and screws. Repair irregular tape joints, sand and remove dust.
 - 3. Painted surface: Remove loose paint or scale. Sand surface of enamel or gloss paint and wipe clean with damp cloth.
 - a. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
 - b. Ensure wall surfaces scheduled to receive tackable wallcovering are properly sealed with a quality primer specified for use under flexible vinyl wallcoverings.
 - c. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- D. Vacuum clean surfaces free of loose particles.
- E. Permanent HVAC system should be set to 68 degrees Fahrenheit (20 degrees Celsius) for at least seventy-two hours prior to, during, and after the installation.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering. Let contact adhesive set tack free.
 - 1. Apply adhesive with a 1/16 inch square notch trowel to the area to receiving the sheet (apply enough for one sheet at a time).
- C. Use wall covering in roll number sequence.
- D. Cut sheets to size including a few inches of overage. Allow sheets to lay flat for at least twenty-four hours prior to the application. Mark roll direction and sequence on the backside of each sheet. Hang sheets in sequence as cut from the roll, do not reverse sheets.
 - 1. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- E. Back roll each sheet prior to the installation to release curl memory.
- F. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.
 - 1. Work from top to bottom then side to side. Roll sheet firmly into adhesive for positive contact and to remove air bubbles.
- G. Horizontal seams are not acceptable.
 - 1. For seamed applications, using a seam and strip cutter remove the factory edge of one sheet. Using the same tool, overlap and trace cut the mating edge of the second sheet. Repeat this step for as many sheets as required for the job.
 - 2. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- H. Scribe, cut, and fit material to butt tightly to adjacent surfaces, built-in casework, and permanent fixtures and pipes.
 - 1. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- I. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- J. Install termination trim.
- K. Remove adhesive residue immediately after each panel is hung with a mild soap/water solution and a soft cloth/sponge.

3.04 CLEANING

- A. Clean wallcovering using a sponge with a neutral pH cleaning solution. Do not use abrasive cleaners. Rinse thoroughly with water and let dry before using.
- B. It is important to remove adhesive while wet.

3.05 PROTECTION

- A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sound-absorbing panels. AWP-1, AWP-2, AWP-3
- B. Mounting accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.
- B. Section 09 21 16 - Gypsum Board Assemblies: Wall finish.
- C. Section 09 72 00 - Wall Coverings.
- D. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.
 - 1. Coordination Drawings: Project-specific Coordination Drawings, indicating the following items drawn and coordinated with each other. Include information required by Installers of each item in order to coordinate the Work. Include the following:
 - a. Relationship of items shown on separate Shop Drawings.
 - b. Dimensions and required clearances of adjacent or related work.
 - c. Order of assembly of separate items.
 - d. Information required for interface with other trades and components, including mechanical, electrical, and communication work required for, integrated with, or adjacent to, acoustic panels work.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.
- E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.
3. Maintenance Data: Recommended procedures for normal cleaning and removal of stains including precautions in use of cleaning materials that may be detrimental to surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

1.07 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for additional mock-up requirements.
- B. Construct mock-up of acoustical units at location as indicated by Architect.
 1. Minimum mock-up dimensions; 96 by 96 inches.
 2. Approved mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

- A. Ambient Conditions: Do not install acoustic panels until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete.
- B. Ambient Conditions: Maintain ambient temperature and humidity conditions at the levels indicated for Project when occupied for its intended use during and after installation of acoustic panels.

1.09 WARRANTY

- A. Manufacturer's written warranty indicating manufacturer's intent to repair or replace acoustical absorber and diffuser panels that fail in materials or workmanship within 3 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:
 1. Fracturing or breaking of unit components which results from normal wear and tear and normal use other than vandalism.
 2. Delamination or other failures of glue bond of components.
 3. Warping of components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
 4. Failure of unit to perform acoustically in accordance with manufacturer's published data.
- B. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.

1. Manufacturers: All materials, wood panel and grid, shall be warranted for (1) one year for material and workmanship.
2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. Manufacturers:

1. Armstrong World Industries, Inc: www.armstrong.com.
2. CertainTeed Corporation: www.certainteed.com.
3. LAMVIN; Sonic Standard Panel: www.lamvin.com/#sle.
4. FabricMate; www.fabricmate.com
5. FabriTRAK Systems, Inc: www.fabritrak.com.
6. Koroseal Acoustic Treatments, Koroseal Interior Products, LLC.; Sound Designs(TM) Panels: koroseal.com. Contact: Scott Hewlett 310.633.1506, shewlett@koroseal.com.
7. Novawall, Inc.; Product "Ultra-High Impact"; www.novawall.com.
8. Owens Corning Conwed Designscape; Respond High Impact Acoustcal Panel: www.conweddesignscape.com.
9. USG: www.usg.com.
10. Wenger: www.wenger.com
11. Substitutions: See Section 01 60 00 - Product Requirements.

B. General:

1. Prefinished, factory assembled fabric-covered panels.
2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Fabric-Covered Acoustical Panels for Walls:

1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
 - a. Facing: 1/16 inch impact-resistant and tackable surface laminated to core.
2. Noise Reduction Coefficient (NRC): 0.70 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
3. Panel Size: 24 inches by 48 inches.
4. Panel Thickness: As required to meet required acoustical performance.
5. Edges: Perimeter edges reinforced by a formulated resin hardener.
6. Corners: As detailed.
7. Fabric: Woven polyester.
8. Color: As indicated. AEP-1, AWP-2, AWP-3
9. Patterns: Where fabric with directional or repeating patterns or fabric with directional weave is used, mark for installation in same direction.

10. Mounting Method: Direct applied with adhesive.

2.02 FABRICATION

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
 - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.
- C. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

2.03 ACCESSORIES

- A. Trim Moldings: Manufacturer's standard wood or vinyl trim moldings for concealing panel joints; color as selected from manufacturer's standards.
- B. Trim Moldings: Custom wood trim moldings as detailed; finish as specified in Section 06 41 00.
- C. Fixing Clips: Manufacturers standard for application as indicated.
- D. Furring Strips: 1 by 2 inch wood furring.
- E. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify blocking, anchorages, and structural supports are in place and adequate to received work.
- C. Verify HVAC and electrical rough-in components are properly located.

3.02 PREPARATION

- A. Coordinate requirements for blocking required in frame construction to receive acoustic panels.
- B. Coordinate installation of acoustic panels to ensure proper installation and operation of each component and, where applicable, to meet acoustic design requirements of rehearsal and performance spaces containing acoustic panels.
 - 1. Sequencing and scheduling of acoustic panels installation with completion of related and adjacent work.
 - 2. Preparation of openings to receive acoustic panels.
 - 3. Placement of blocking, anchorages, and structural supports required for acoustic panels.
 - 4. Installation of HVAC and electrical rough-in components for connection to acoustic panels.

5. Preparation of Project Record Documents for acoustic panels.
6. Coordinate preparation of operation and maintenance manuals for acoustic panels.
7. Coordinate demonstration and training activities for acoustic panels.

3.03 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- C. Install wall-mounted acoustical panels utilizing corner mounting z-brackets or grooved buttons and concealed wall brackets. Where indicated, secure units to wall with fasteners along top of unit.
- D. Do not modify panels in the field.
- E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 1. Plumb and level.
 2. Flatness.
 3. Width of joints.

3.04 FIELD QUALITY CONTROL

- A. Should completed installation fail to meet requirements, Contractor shall make modifications necessary to correct performance and retest room as directed by Architect to indicate compliance, at Contractor's expense.

3.05 CLEANING

- A. Repair or replace visual/performance defective work as directed by Architect upon inspection.
- B. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- C. Clean unit surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

3.06 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces of steel lintels and ledge angles.
 - 2. Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 7. Floors, unless specifically indicated.
 - 8. Brick, Architectural concrete, and Cast stone.
 - 9. Glass.
 - 10. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 50 00 - Metal Fabrications: Shop-primed items.
- C. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

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

- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- D. SCAQMD 1113 - Architectural Coatings.
- E. SSPC-SP 1 - Solvent Cleaning.
- F. SSPC-SP 2 - Hand Tool Cleaning.
- G. SSPC-SP 6 - Commercial Blast Cleaning.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

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

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
- B. Paints:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - a. Local representative Jan Piccola 714.679.5730.
 - 2. Dunn-Edwards Corporation: www.dunnedwards.com,
 - a. Local representative Wanda Barragan 909.261.1289.
 - 3. PPG Paints: www.ppgpaints.com/#sle.
 - 4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - a. Local representative John Dumesnil 619.665.9341.
 - 5. Vista Paint: www.vistapaint.com.
 - a. Local representative Mark Brower 323.397.9000.

- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - d. Architectural coatings VOC limits of California.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Flammability: Comply with applicable code for surface burning characteristics.
- E. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- F. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete masonry units and primed metal.
 - 1. One or two coats to cover and one coat primer.
 - 2. Top Coat(s): Exterior Latex.
 - 3. Top Coat Sheen:

- a. Flat: MPI gloss level 1; use this sheen at all locations.
 - b. Semi-Gloss: MPI gloss level 5; use this sheen at trim.
- 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Masonry/Concrete and CMU Opaque, Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Low-Sheen-Elastomeric: Two coats of latex-acrylic.
 - 3. Premium Flat: Two coats of latex-acrylic enamel.
- C. Exterior Plaster, Opaque, 100% Acrylic Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Flat: Two coats of latex.
- D. Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of latex primer.
- E. Ferrous Metals, Primed, Latex, 2 Coat:
 - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
- F. Ferrous Metals, Unprimed, High-Performance, 3 Coat:
 - 1. Pre-Treatment: As recommended by manufacturer
 - 2. One coat galvanize primer.
 - 3. Gloss: Two coats of alkyd enamel.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Alkali Resistant Water Based Primer.
 - 2. Interior/Exterior Latex Block Filler.
 - 3. Anti-Corrosive Alkyd Primer for Metal.
 - 4. Interior/Exterior Quick Dry Alkyd Primer for Metal.
 - 5. Alkyd Primer for Galvanized Metal.
 - 6. Water Based Primer for Galvanized Metal.
 - 7. Rust-Inhibitive Water Based Primer.
 - 8. Interior/Exterior Quick Dry Primer for Aluminum.
 - 9. Stain Blocking Primer.

2.05 ACCESSORY MATERIALS

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
 - 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- H. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- J. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

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

3.06 PROTECTION

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

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Prime surfaces to receive wall coverings.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Ceramic and other tiles.
 - 7. Glass.
 - 8. Acoustical materials, unless specifically indicated.
 - 9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

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

- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.
- C. SCAQMD 1113 - Architectural Coatings.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 2 - Hand Tool Cleaning.
- F. SSPC-SP 6 - Commercial Blast Cleaning.
- G. SSPC-SP 13 - Surface Preparation of Concrete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
- B. Paints:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - a. Local representative Jan Piccola (714) 679-5730.
 - 2. Dunn-Edwards Corporation: www.dunnedwards.com,
 - a. Local representative Wanda Barragan (909) 261-1289.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - a. Local representative John Dumesnil (619) 665-9341.
 - 4. Vista Paint; www.vistapaint.com .
 - a. Local representative Mark Brower (323) 397-9000.
- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

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

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.
- C. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. Architectural coatings VOC limits of California.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Flammability: Comply with applicable code for surface burning characteristics.
- E. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- F. Colors: As indicated on drawings.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
1. Two top coats and one coat primer.
 2. Top Coat(s): Interior Latex.
 3. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.
 - b. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
 4. Primer: As recommended by top coat manufacturer for specific substrate.

- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 - 1. Medium duty applications include doors and door frames.
 - 2. Two top coats and one coat primer.
- C. Medium Duty Vertical and Overhead: Including gypsum board, concrete, uncoated steel, shop primed steel, galvanized steel, and aluminum.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Interior Light Industrial Coating, Water Based.
- D. Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 - 1. Shop primer by others.
 - 2. One top coat.
 - 3. Top Coat: Latex Dry Fall.
- E. P-7 Interior Surfaces to be Finished with Dry Erase Coating.
 - 1. One top coat.
 - 2. Top Coat(s): Dry Erase Coating, Waterbased Polyurethane.
 - a. Products:
 - 1) IdeaPaint™ PRO, 2-part, solvent-based
 - 2) Sherwin-Williams Dry Erase Clear Gloss Coating.
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Sheen: Gloss.
- F. Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of latex primer.
 - 2. Semi-gloss: Two coats of latex enamel.
- G. Aluminum, Unprimed, Latex, 3 Coat:
 - 1. One coat etching primer.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Interior Institutional Low Odor/VOC Primer Sealer.
 - 2. Interior/Exterior Latex Block Filler.
 - 3. Interior Latex Primer Sealer.
 - 4. Interior Drywall Primer Sealer.
 - 5. Anti-Corrosive Alkyd Primer for Metal.
 - 6. Interior Rust-Inhibitive Water Based Primer.
 - 7. Interior Water Based Primer for Galvanized Metal.
 - 8. Interior/Exterior Quick Dry Primer for Aluminum.

9. Interior Alkyd Enamel Undercoat.
10. Stain Blocking Primer.
11. Stain Blocking Primer, Water Based.

2.05 ACCESSORY MATERIALS

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. 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. Gypsum Wallboard: 12 percent.
 2. Plaster and Stucco: 12 percent.
 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- F. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- J. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- K. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- L. Wood Surfaces to Receive Opaque Finish: 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. Back prime concealed surfaces before installation.
- M. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

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

3.06 PROTECTION

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

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Markerboards
- B. Tackboards
- C. Tackable wall panels. TWP-5

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Concealed supports in metal stud walls.
- B. Section 06 41 00 - Architectural Wood Casework: Sliding markerboards integrated with casework.
- C. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard.
- B. ANSI A208.1 - American National Standard for Particleboard.
- C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.
- G. GANA (GIB 01-0300) - Glass Informational Bulletin (Proper Procedures for Cleaning Architectural Glass Products).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.
- E. Test Reports: Show compliance to specified surface burning characteristics requirements.
- F. Manufacturer's printed installation instructions.
- G. Maintenance Data: Include data on regular cleaning, stain removal.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. WhiteBoards & Tackboards
 - 1. A-1 Visual Systems Co.: www.a-1visualsystems.com.
 - 2. Chatfield-Clarke: www.chafield-clarke.com.
 - 3. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
 - 4. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
 - 5. Platinum Visual Systems: pvusa.com
 - 6. Polyvision Corporation: www.polyvision.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Color: White.
 - 2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
 - 3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 - 4. Backing: Aluminum foil, laminated to core.
 - 5. Size: As indicated on drawings.
 - 6. Frame: Extruded aluminum, with concealed fasteners.
 - 7. Frame Profile: As indicated on drawings.
 - 8. Frame Finish: Anodized, natural.
 - 9. Accessories: Provide marker tray and map rail.
- B. Tackboards: Fine-grained, homogeneous natural cork.
 - 1. Cork Thickness: 1/4 inch.
 - 2. Fabric: Vinyl coated fabric.
 - 3. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 - 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 - 5. Size: As indicated on drawings.
 - 6. Frame: Extruded aluminum, with concealed fasteners.
 - 7. Frame Profile: As indicated on drawings.
 - 8. Frame Finish: Anodized, natural.

9. Accessories: Provide map rail and flag holder.
- C. Tackable Wall Panels: Fabric laminated to fiberboard; Factory-fabricated.
 1. Fabric: Vinyl coated fabric. TWP-5
 2. Color, Pattern, and Texture: As indicated on drawings.
 3. Backing: Fiber board, 1/2 inch thick, laminated to tack surface.
 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 5. Panel Width: 48 inches.
 6. Height: Full height of room or wall; No horizontal seams.
 7. Edge Treatment: Square edge unless detailed otherwise.
 8. Edge Molding: Provide metal "J-mold" type edge trim for exposed edges at door and window openings and similar conditions.
 9. Adhesives: Provide manufacturer's recommended adhesive, primer, and sealer, produced for use on substrate shown on drawings. Provide materials which are mildew-resistant and non staining to wallcovering.
 10. Manufacturers:
 - a. A-1 Visual Systems Co.: www.a-1visualsystems.com.
 - b. ABC School Equipment: www.abcse.com.
 - c. ADP Lemco, Inc: www.adplemco.com/#sle.
 - d. Chatfield-Clarke; Vinyl Tackboard Panels: www.chafield-clarke.com.
 - e. Claridge Products and Equipment, Inc; 3400 Series: www.claridgeproducts.com/#sle.
 - f. Lamvin Inc.; Tackboard Panels: www.lamvin.com.
 - g. MooreCo, Inc: www.moorecoinc.com/#sle.
 - h. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
 - i. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards in a single frame, of materials specified above.
 1. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
 2. Configuration: As indicated on drawings.
 3. Units Too Large to Ship Assembled: Fully assembled in factory, then disassembled for shipping.

2.03 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Hardboard for Chalk Surface: ANSI A135.4, Tempered type.
- C. Vinyl Coated Fabric: ASTM F793/F793M Category VI.
- D. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).

- E. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- F. Fiber Board: ASTM C208, cellulosic fiber board.
- G. Foil Backing: Aluminum foil sheet, 0.005 inch thick.
- H. Steel Sheet Backing: Manufacturer's standard thickness, galvanized.
- I. Adhesives: Type used by manufacturer.

2.04 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
- E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near chalkrail.
- F. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, manufacturer's standard fastening method, same finish as frame.
- G. Mounting Brackets: Concealed.
- H. Factory printed grid lines for music rooms.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 PREPARATION

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.
- B. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- D. Protect glass and equipment from damage caused by work of this Section.

3.03 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of marker tray at 30 inches above finished floor.
- C. Secure units level and plumb.

- D. Butt Joints: Install with tight hairline joints.
- E. Carefully cut holes in boards for thermostats and wall switches.
- F. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.
 - 1. Fabricate re-wrapped edges where partial panels abut each other, or adjacent surfaces or trim.
 - 2. Re-wrap top, bottom or side edges for cutting panels around door or window openings, abutting trim, protruding objects, and at other openings, including x-cut at receptacles, light switches, and other openings.
 - a. Wrap minimum 2 inches around back of panel.
 - b. Carefully cut fiber board, leaving vinyl wallcovering intact. Wrap wallcovering tightly around edge of board and adhere continuously around back of panel with manufacturer's recommended vinyl wallcovering adhesive.

3.04 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.
- D. Clean glazing materials in accordance with GANA (GIB 01-0300).

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Emergency evacuation maps.

1.02 RELATED REQUIREMENTS

- A. Section 10 14 53 - Traffic and Parking Signage: Fire lane, accessibility and traffic signage.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from District through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by District through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. ASI Sign Systems, Inc.: www.asisignage.com.
 - 2. Best Sign Systems, Inc: www.bestsigns.com.
 - 3. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com/#sle.
 - 4. Cosco Industries (non-ADA signs): www.coscoarchitecturalsigns.com/#sle.
 - 5. FASTSIGNS: www.fastsigns.com/#sle.
 - 6. Inpro: www.inprocorp.com/#sle.
 - 7. Mohawk Sign Systems, Inc: www.mohawksign.com.
 - 8. Quiel Signs: www.quielsigns.com
 - 9. Seton Identification Products: www.seton.com/aec.
 - 10. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
 - 1. Requirements for Persons with Disabilities: Provide identifying devices meeting the requirements for the physically disabled of the following codes:
 - a. California Building Code (CBC) Title 24, Part 2; Chapter 11B, Accessibility.
 - b. Code of Federal Regulations 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
 - 2. Raised characters shall comply with CBC 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 inch 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 a non-glare 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 Sections 11B-703.2.4 and 11B-703.2.6; 10% minimum and 20% maximum, if characters are also used as visual signs.
 - e. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7.
 - 1) 11B-703.2.8 Line spacing. Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
 - f. Format: Text shall be in a horizontal format. CBC 11B-703.2.9.
 - g. Braille: It shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4. Braille dots shall have a domed and rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
 - h. Mounting height: Tactile sign on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1.
 - i. Mounting location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2 as follows:
 - 1) alongside a single door on the latch side.
 - 2) on the inactive leaf of a double door with one active leaf.
 - 3) to the right of the right hand door at double doors with two active leaves.
 - 4) on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - 5) so that a clear floor space of 18 x 18 inch minimum, centered on the tactile characters, is beyond the arc of any door swing between the closed position and 45 degree open position.
 - j. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.
 - 1) Visual character stroke thickness of the uppercase letter "I" shall be 10 % minimum and 20% maximum of the height of the character. CBC Section 11B-703.5.7
 - k. Pictograms shall comply with CBC Section 11B-703.6.
 - l. Symbol of accessibility shall comply with CBC Section 11B-703. 7.
 - m. Variable message signs shall comply with CBC Section 11B-703.8.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
- 1. Sign Type: Flat signs with injection molded or etched panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 1 inch.

4. Sign Height: 3 inches, unless otherwise indicated.
5. Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings.
6. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
7. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
 - a. Identify all single user toilet facilities as gender neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.7.2.6.3.
 - 1) No pictogram, text, or braille is required.
 - 2) Tactile jamb signage shall comply with appropriate technical requirements of CBC Section 11B-703.
 - (a) Examples of appropriate designations are "ALL-GENDER RESTROOM", "RESTROOM", or "UNISEX RESTROOM". DSA BU-17.
 - (b) Provide "RESTROOM" as the signage text, unless indicated otherwise on Drawings.
 - 3) See Drawings for actual sign to be provided.
 - b. Geometric Symbols: The symbol color shall contrast with door or wall.
 - 1) Comply with CBC 11B-216.8.1 at the entrances to toilet and bathing rooms.
 - 2) Comply with CBC 11B-703.7.2.6.
 - (a) Men's: An equilateral triangle, ¼ inch thick edges with edges 12 inches long and a vertex pointing upward.
 - (b) Women's: A circle, ¼ inch thick and 12 inches in diameter.
 - (c) Unisex: A circle, ¼ inch thick and 12 inches in diameter with a equilateral triangle, ¼ inch thick edges with edges 12 inches long and a vertex pointing upward, superimposed on and geometrically inscribed within the circle and within the 12 inch diameter. The vertex of the triangle shall be located ¼ inch from the edge of the circle. The triangle shall contrast with the circle symbol, either light on a dark background or dark on a light background. The circle symbol shall contrast with the door.
 - (d) Mount within 1 inch of the centerline of the door at minimum 58 inches and 60 inches maximum from the centerline of the symbol to the finished floor surface.
8. Exits: Provide raised character and Braille exit signs per CBC Section 1013.4 at the following locations:

<u>Location</u>	<u>Text</u>
Grade level exit door	EXIT

C. Emergency Evacuation Maps:

1. Allow for one map per building.
2. Map content to be provided by District.
3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
 - a. Provide visually matching back plate when mounted on a glass surface.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: As scheduled.
 - 4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved or photopolymer etched through face to expose core as background color:
 - 1. Interior Basis of Design Product: InTouch™ ADA-Ready™ Sign System with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details as manufactured by ASI Sign Systems, Inc., or approved equal.
 - 2. Total Thickness: 1/8 inch, matte finished acrylic.
 - 3. Fabrication:
 - a. 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 photopolymer bonded process. Sign face of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.
 - 2) 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. Tactile characters to be raised min. 1/32 inch from surface. Computerized translation of sign copy to be responsibility of the manufacturer.
 - b. Letter style[s], color[s], letter size[s] and layout position:
 - 1) As selected by Architect from manufacturer's standard letter style and color charts.
 - c. Text Schedule: As indicated on Drawings.
 - d. Tactile Lettering and Graphics Color Options: As selected by Architect from manufacturer's standard colors.
 - e. Mounting Panel Options:
 - 1) Size:
 - (a) Same size.
 - f. Background Appearance Options:
 - 1) Solid color[s]: As selected by Architect from manufacturer's standard colors.
 - 2) Subsurface custom graphics.

- g. Overall panel size: As indicated on Drawings.
- h. Shape: As indicated on Drawings.
- B. Etched Metal Panels: Zinc based panel etched through face to expose core as background color:
 - 1. Exterior Basis of Design Product: SignEtch™ ADA-Ready™ Sign System with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details as manufactured by ASI Sign Systems, Inc., or approved equal.
 - 2. Total Thickness: 1/8 inch.
 - 3. Paint: Primer and urethane based color coat, of type standard with manufacturer.
 - a. U.V. resistant clear urethane top coat required for exterior applications.
 - 4. Fabrication:
 - a. 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.
 - 2) 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.
 - b. Letter style[s], color[s], letter size[s] and layout position:
 - 1) As selected by Architect from manufacturer's standard letter style and color charts.
 - c. Raised text and graphic finishes:
 - 1) Colors/Sheen:
 - (a) As selected by Architect from manufacturer's standard colors.
 - (b) Finish: Matte.
 - d. Text Schedule: As indicated on Drawings.
 - e. Edge Detail: Square.
 - f. Edge Finish: Brushed.
 - g. Overall panel size: As indicated on Drawings.
 - h. Recessed Graphics Color Options:
 - 1) As selected by Architect from manufacturer's standard colors.
 - i. Recessed Area Texture Options:
 - 1) Smooth paint.

2.05 NON-TACTILE SIGNAGE MEDIA

- A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
 - 1. Sign Color: Clear.
 - 2. Total Thickness: 1/8 inch.

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

- B. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material.
- C. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material.
- D. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- E. Exposed Screws: Stainless steel.
 - 1. Exposed fasteners are permitted only where specifically indicated, and shall be tamper proof stainless steel, countersunk, and may be painted or finished to match adjacent surfaces.
- F. Tape Adhesive: Double sided tape, permanent adhesive.
- G. Adhesives:
 - 1. Type recommended by the manufacturer of the material specified to be laminated or adhered.
 - 2. No adhesives that fade, discolor or delaminate as a result of proximity to sunlight or heat therefrom shall be used.
 - 3. Adhesives shall not change the color or otherwise deteriorate the materials to which they are to be applied.
 - 4. The adhesives shall be of non-staining, non-yellowing quality.
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Do not start work until deficiencies have been corrected. Start of work of this section constitutes acceptance of the surfaces.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mounting Method:
 - 1. Mount signs to surfaces with a minimum of four countersunk tamperproof stainless steel fasteners.
 - 2. Provide anchorage where necessary for fastening signs securely in place.
 - a. Anchorage not otherwise specified or indicated shall include expansion shields and power-driven fasteners;
 - 1) when approved:
 - (a) for concrete and masonry;
 - (b) toggle or molly bolts to plaster surfaces;
 - (c) full threaded wood screws to wood doors;

- (d) machine or metal screws to metal doors.
 - b. Provide backing plates for mounting to expanded metal substrates.
- 3. Adhere signs to glass with adhesive.
- C. Install neatly, with horizontal edges level.
- D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and CBC Chapter 11B.
 - 1. Room and Door Signs: Locate on wall at latch side of door a minimum of 48 inches to the baseline of the lowest braille cells; with baseline of highest line of raised character text at maximum 60 inches above finished floor.
 - a. Comply with CBC 11B-703.4.1
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.03 FIELD QUALITY CONTROL

- A. Inspect signs for information content, appearance, location and Braille per as noted in Section 01 45 33 - Code-Required Special Inspections.

3.04 ADJUST AND CLEAN

- A. Repair damage to signs incurred during installation. Replace signs which cannot be repaired to new condition. Clean glass, frames, and other sign surfaces, adjust hardware for proper operation.

END OF SECTION

SECTION 10 14 53

TRAFFIC, PARKING AND SITE SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Traffic and parking control, plaque, and informational signage.
- B. Sign supports and foundations.

1.02 RELATED SECTIONS

- A. Section 10 14 00 - Signage: Informational signage in addition to on-site signage specified in this section.
- B. Section 32 13 13 - Site Concrete: Concrete substrate.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1910.145 - Accident Prevention Signs and Tags.
- B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- D. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.
- E. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.
- F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- G. FED-STD-595C - Colors Used in Government Procurement (Fan Deck).
- H. NFPA 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response.
- I. SAE AMS-STD-595 - Colors Used in Government Procurement.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including location, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When content of signs is indicated to be determined later, request such information from District through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 2. Submit for approval by District through Architect prior to fabrication.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Codes and regulations of authorities having jurisdiction for accessible parking stall identification, including the following:

1. California Code of Regulations (CCR), Title 24, Parts 2, 3 and 5.
2. California Building Code (CBC) Section 11B-502.6, including amendments and supplements as adopted by Authority Having Jurisdiction (AHJ) as shown on Drawings.
3. Manual on Uniform Traffic Control Devices as adopted by the State Department of Transportation.
 - a. Reflectively requirements

PART 2 - PRODUCTS

2.01 TRAFFIC AND PARKING CONTROL SIGNAGE

- A. Manufacturers:
 1. Hawkins Traffic Safety Supply, Inc.: www.hawkinstraffic.com.
 2. Safeway Sign Company: www.safewaysign.com.
 3. Western Highway Products, Inc.: www.westernhighway.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Plaque Signs: Provide manufacturer's standard silk-screened signs, baked-on enamel applied over Diamond Grade (DG), (10-year projected life) retro-reflectorized backing; on aluminum or 16 gage galvanized steel sheet. Provide with anti-graffiti protective overlay film. Produce smooth, even, level sign surfaces, constructed to remain flat under installed condition within a tolerance of plus or minus 1/16-inch measured diagonally. Provide two holes for post mounting.
 1. Traffic Entry Warning Signs: Sign text, traffic and regular parking control shall comply with requirements of California Code of Regulations (CCR) Title 24, Part 2, Section 11B-502.6 and regulations of local governing authorities.
 - a. Single post mount, not less than 17 x 22 inches with white reflectorized copy on blue background conforming to No. 15090, SAE AMS-STD-595 (FED-STD-595C), one inch high letters to read as indicated on Drawings.
 - b. Position sign in a conspicuous location immediately adjacent to each entrance to off-street parking facility or immediately adjacent to and visible from each stall or space.
 - c. Sign shall be mounted 60 inches from bottom of sign to the adjacent finish grade when mounted on walls or fence; or 80 inches to pedestrian way or sidewalk or as shown on the drawings.
 2. Parking Stall Signs: Sign text, accessible parking control shall comply with requirements of State of California Code of Regulations (CCR) - Title 24, Part 2, Section 11B-502.6 in addition to requirements of State of California, Department of Transportation (CALTRANS) and regulations of local authorities having jurisdiction.
 - a. Single post mount, not less than 70 square inches with white reflectorized copy on blue background conforming to No. 15090, SAE AMS-STD-595 (FED-STD-595C). Sign shall display a profile view of a wheelchair with occupant in white on blue background.
 - 1) Provide an additional sign below the accessible sign with the text "Minimum Fine \$250".

- b. Position one sign at the end of each parking space designated for disabled usage.
 - c. One in every six spaces (CBC 11B-208.2.4), but not less than one, provide a 12 inch by 3-1/4 inch "Van Accessible" sign below the symbol of accessibility, wording per CBC 11B-502.6, 36 CFR 1191, and ADA Standards.
 - d. Sign shall be mounted 80 inches from bottom of sign to finish grade of parking space or centered on wall at interior end of parking space at a minimum height of 60 inches above the parking space, finished grade, ground or sidewalk, to the bottom of the sign.
- 3. Fire Lane Signs:
 - a. Single post mount, of size, color and sign text as shown on site plan or as required by local codes and fire department authority.
 - b. Quantity, location and mounting heights to be determined by local fire department authority.
- 4. Fire Safety Signage:
 - a. Provide sign, types, shapes, and content as indicated on Drawings and as required for products in-use, stored, and installed.
 - b. Comply with OSHA 29 CFR 1910.145, NFPA 704, ANSI Z535.2, ANSI Z535.4, and California Fire Code.

2.02 ACCESSORIES AND FASTENERS

- A. Accessories: Provide welded galvanized steel fittings and galvanized or cadmium-plated steel bolts, nuts and washers.
- B. Fasteners: Provide tamper-proof galvanized steel fasteners.
 - 1. Tufnut System (714) 962-5838, Allegheny Bolt (Tampruf brand; (516) 568-1052 or equal.

2.03 SIGN SUPPORTS AND FOUNDATION

- A. Support Posts:
 - 1. Galvanized Steel Rail for Bolt-Together Framing:
 - a. Yield Strength: 60,000 psi.
 - b. Post and Footing Insert Size: As indicated on Drawings.
 - c. Post: Basis of Design Product: 6535K372 as distributed by McMaster Carr, or equal.
 - d. Footing Insert: Basis of Design Product: 6535K392 as distributed by McMaster Carr, or equal.
 - e. Curved/Angle Bolt: Basis of Design Product: Curved Bolt Set for 1-3/4" High Rails for Bolt-Together Framing as distributed by McMaster Carr, or equal.
- B. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.
- C. Provide other materials as necessary for complete installation, as recommended by manufacturer and selected by Contractor, subject to approval of Architect.

2.04 FABRICATION

- A. Provide signs and supports factory-prefabricated and pre-finished, ready for assembly and installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

- A. Locate accessible car and van parking stall and drive approach signs where shown on Drawings and as required by applicable ordinances and regulations of authorities having jurisdiction. Verify and coordinate sign locations to prevent conflict with underground utilities.
- B. Locate informational signage as verified in field by District. Verify and coordinate sign locations to prevent conflict with underground utilities.
- C. Excavate for sign support footings to depth as shown on Drawings or, if not shown, as recommended by manufacturer. Provide forms for concrete not supported by compacted soil.
- D. Set posts in concrete base, minimum 12 inch diameter and 18 inches deep; unless indicated otherwise on Drawings.
 - 1. Signs set in asphaltic paving surfaces or concrete sidewalks shall be mounted in core drilled holes minimum 8 inch diameter, 18 inches deep with top of base flush to finish.
 - 2. Signs mounted to walls shall be attached firmly with appropriate expansion anchors or bolting, adhesive not permitted.
 - 3. Seal all holes water tight.
- E. Set sign support post plumb and so sign face will be perpendicular to stall or parallel to curb face, as applicable. Set posts into pipe sleeve inserts set and anchored into concrete. Fill annular space between posts and sleeves with grouting compound.
- F. Place and cure concrete in accordance with requirements of Section 03 30 00 - Cast-in-Place Concrete.
- G. Install plaque signage to posts, with panel facing traffic as necessary.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments. TP-1
- B. Urinal and vestibule screens.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Concealed supports, included in wall framing and plates.
- B. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- C. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports, included in wall framing and plates and above ceiling framing.
- D. Section 10 28 00 - Toilet Accessories.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. California Building Code (CBC) chapter 11B, disabled accessibility regulations.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- F. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
 - 1. If other than specified manufacturer or specified product, submit catalog data.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
 - 1. Show plan and elevation views for each room. Indicate types and thicknesses of materials and assemblies.
 - 2. Attachment details.

- D. Samples: Submit two samples of partition panels, 2 by 2 inch in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 WARRANTY

- A. All components shall have a 15 year limited warranty.

1.07 PACKAGING, DELIVERY, STORAGE AND HANDLING

- A. Packaging: Maintain factory packaging and protective coverings.
- B. Storage: Store panels to prevent impact and moisture damage.

1.08 PROJECT CONDITIONS

- A. Field Measurements: Verify field design and field dimensions before submitting shop drawings and before fabrication.
- B. Environmental Conditions: Maintain humidity and temperature in ranges required by manufacturer.

1.09 SEQUENCING AND SCHEDULING

- A. Complete tile and painting Work before toilet partition installations.
- B. Coordinate dimensions and locations of cut-outs and panel reinforcement with approved toilet accessories.
- C. Coordinate backing and blocking provisions in walls.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Code compliance of these systems must be verified prior to use. They may be no longer available and are not yet proven to be compliant with NFPA 286, per CBC Sections 402.6.4.4, **803.1.2, 803.11**, 2604.2.4, 2614.4.
- B. Installation shall meet requirements for the physically disabled of the California Code of Regulations (CCR) Title 24 Part 2 and latest amendments to the Americans with Disabilities Act (ADA Standards) Accessibility Guidelines, 36 CFR 1191.
- C. California Building Code (CBC) disabled accessibility regulations.
 - 1. Wheelchair accessible compartment shall comply with CBC Section 11B-604.8.1.
 - 2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and Figure 11B-604.8.1.4.
 - a. It shall be 9 inches high minimum above the finish floor and 6 inches deep minimum beyond the compartment side face of the partition, exclusive of partition support members.
 - b. It shall be 12 inches high minimum above the finish floor for children's use.
 - c. Partition components at toe clearances shall be smooth without sharp edges or abrasive surfaces.
 - d. Toe clearance is not required in a compartment greater than 66 inches wide.

3. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets totals six or more fixtures.
 - a. Such compartment shall be provided in the same quantity as wheelchair accessible compartments per CBC Section 11B-213.3.1 and shall comply with CBC Section 11B-604.8.2.
4. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Section 11B-404 except that if the approach is on the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44 inches minimum. CBC Figure 11B-604.8.2.
5. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the accessible compartment door near the latch.
6. Ambulatory Accessible Toilet Compartment doors shall not swing into the clear floor space or clearance required for any fixture or into the minimum required compartment area. CBC 11B-604.8.2.2.

2.02 MANUFACTURERS

A. Plastic Toilet Partitions:

1. TP-1 Basis of Design Product: Hiny Hiders as manufactured by Scranton, or approved equal.
2. ASI Accurate Partitions; Solid Plastic (HDPE): accuratepartitions.com.
 - a. Modified NFPA 286 Compliant.
3. ASI Global Partitions; Solid Plastic (HDPE): globalpartitions.com.
 - a. Modified NFPA 286 Compliant.
4. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
5. Bradley Corporation; Bradmar® Solid Plastic (HDPE) — Series 400 – Sentinel: www.bradleycorp.com.
 - a. Not known to be NFPA 286 Compliant.
6. Hadrian Inc. : www.hadrian-inc.com.
 - a. Not known to be NFPA 286 Compliant.
7. Partition Systems International of South Carolina; Antimicrobial PolyLife Toilet Partitions: www.psisc.com/#sle.
 - a. Not known to be NFPA 286 Compliant.
 - b. Local representative, Stipher & Associates (949) 582-5755.
8. Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.
 - a. Tested, but not all colors are known to be NFPA 286 Compliant.
9. Substitutions: Section 01 60 00 - Product Requirements.

2.03 PLASTIC TOILET COMPARTMENTS

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286, floor-mounted headrail-braced.

1. Color: Single color as selected.
- B. Flame Spread Rating (ASTM E84):
 1. Class B flame spread 26-75 and smoke developed of 0-450.
- C. Doors:
 1. Thickness: 1 inch.
 2. Width: 24 inch.
 3. Width for Accessible Use: 36 inch, out-swinging.
 4. Comply with CBC Section 11B-604.8.1.2.
 5. Height: 55 inch.
- D. Panels:
 1. Thickness: 1 inch.
 2. Height: 55 inch.
 3. Depth: As indicated on drawings.
- E. Pilasters:
 1. Thickness: 1 inch.
 2. Width: As required to fit space; minimum 3 inch.
- F. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets .
 1. Urinal Screens: Wall mounted with continuous panel brackets.
 - a. Height: 42 inches, mounted 14 inches above floor
 - b. Depth: 24 inches.

2.04 FABRICATION

- A. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required.

2.05 ACCESSORIES

- A. Do not furnish chrome plated, non-ferrous cast alloy material for hinges, brackets, locks, latches and all fittings and accessories.
- B. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with satin finish, 4 inch high, concealing floor fastenings.
 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
 - a. Provide 3/8 inch threaded rod, spring washer and locking nut attached to 4 inch expansion anchors embedded in the concrete floor
- C. Head Rails: Extruded aluminum, anti-grip profile.
 1. Size: Manufacturer's standard size.
 2. Fit over tops of pilasters and at headrail brackets with one way sex bolts.
- D. Wall and Pilaster Brackets: Stainless steel; continuous type.

- E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- F. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Continuous-type hinge, self closing.
- G. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - a. Configuration: Surface mounted and through bolted to door with one way sex bolts
 - b. Material: Cast stainless steel.
 - c. SS Door Latch Basis of Design Product: ADA Slide Bolt Latch & Keeper SS, Manufacturer part # 6049, 1002927 as manufactured by Bobrick, or approved equal.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - a. Configuration: Wrap around flange surface mounted and through bolted to pilaster with one way sex bolts
 - b. Material: Cast stainless steel.
 - c. Strikes: 6 inches long.
 - d. Door bumper to accommodate projection of all door hardware and toilet accessories.
 - e. Inswing Keeper Basis of Design Product: Hiny Hider Aluminum 6" Inswing Strike And Keeper For 1" Post as manufactured by Scranton Products, or approved equal.
 - f. Outswing Keeper Basis of Design Product: Hiny Hider Aluminum 6" Outswing Keeper Bumper For 1" as manufactured by Scranton Products, or approved equal.
 - 3. Provide ADA compliant door pull for swinging doors.
 - a. Surface mounted U-shaped or wire pulls on both sides of accessible compartment doors.
 - b. Chrome Plated Double Door Pull 5-1/2", for 1 inch thick doors.
 - c. Overall width is 6-3/4 inches with 5-7/8 inch hole spacing.
 - d. Basis of Design Product: Double Door Pull 5-1/2" Stainless Steel part # 610112 as manufactured by Hadrian, or approved equal.
- H. Coat Hook: One per compartment, mounted on door.
 - 1. Mount such that no portion is over 47 inches above finish floor.
- I. Fasteners, General:
 - 1. Concrete Anchors: Stainless steel expansion or self-threading, as specified in Section 050519 - Post-Installed Concrete Anchors. Lead expansion shields are not acceptable.
 - 2. Fasteners:
 - a. Provide stainless steel, vandal resistant fasteners throughout, one-way upset head.
 - b. Molly-type fasteners, chrome plated zamac, toggle bolts and other hollow wall anchors are not acceptable.
 - c. See general requirements for fasteners specified in Section 05 50 00 - Metal Fabrications.

3. Concealed Fasteners: Galvanized steel or stainless steel.
4. Exposed Fasteners: Stainless steel.
5. Panel-to-Panel Fasteners: Use thru-bolted attachments at panels, doors and pilasters with sex nut bolts through clamp flanges.
6. Metal Framing Anchors: Use self-tapping metal screws through wall finish into metal framing or backing sheets.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examination: Prior to application of gypsum board tile backing or other wall finishes, inspect framing at toilet compartments and urinal screens and ensure that necessary and proper backing is provided in wall for anchoring of panels.

3.02 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.03 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
 1. Use fasteners as shown on reviewed shop drawings.
 - a. Where fasteners to substrate are not indicated, provide fasteners as specified in Section 050519 - Post-Installed Concrete Anchors.
 2. Secure divider panels to built-in anchorage devices using concealed fasteners. Level, plumb and tighten installation with devices provided.
 3. Anchors to Concrete:
 - a. Use stainless steel expansion anchors, or self-threading concrete anchors.
 - b. Power-driven fasteners or lead expansion shields are not acceptable.
 4. Anchors to Plaster or Gypsum Wallboard (with and without tile finish):
 - a. Use sheet metal screws to metal framing or backing, wood screws to wood framing or backing.
 - b. Molly-type fasteners are not acceptable.
 5. Panel-to-Wall Installation:
 - a. Provide clearances of not more than 1 inch between panels and walls.
 - b. Secure panels to walls with continuous brackets so that holes for wall anchorage occur in masonry or tile joints.
 - c. Secure panels in position with manufacturer's recommended anchoring devices.

- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
 - 1. Provide clearances of not more than 1/2 inch between pilasters and panels.
 - 2. Secure panels to pilasters with continuous brackets located to align with continuous brackets at wall.
- E. Floor Anchors: Set pilaster units with anchorage as specified herein. Level, plumb, and tighten installation for durable installation.
- F. Field touch-up of scratches or damaged finish are not permitted. Replace damaged or scratched materials with new materials.

3.04 TOLERANCES

- A. Alignment Tolerance: Plus or minus 1/16 inch, in any direction.
- B. Maximum Variation From True Position: 1/4 inch, except at required dimensions at accessible spaces.
- C. Maximum Variation From Plumb: 1/8 inch.

3.05 ADJUSTING

- A. Operation: Doors shall operate smoothly and evenly.
- B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
 - 1. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.
- C. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
 - 1. Adjust doors to remain open at approximately 30 degrees.
- D. Adjust adjacent components for consistency of line or plane.
- E. Field Operation and Alignment Check: Demonstrate compliance with specified tolerance and operation requirements.
 - 1. Should check reveal misalignment, improper operation or inadequate anchorage, realign, adjust and re-anchor the entire installation to Architect's satisfaction.
 - 2. Replace deformed, marred, damaged or dented parts at no change in Contract Time or Sum.

3.06 CLEANING

- A. Cleaning After Installation: Clean exposed surfaces of panel systems using materials and methods recommended by manufacturer.
- B. Protection: Provide protection as necessary to prevent damage during remainder of construction period.
- C. Final Cleaning: Clean partitions to dust-free condition prior to Final Acceptance.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards. WP-1

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.
- B. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 24 inches long.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for District's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
- G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.
- C. Provide five year manufacturer and installer warranty for metal crash rails.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Koroseal Interior Products; #GS10: www.koroseal.com/#sle.
 - 2. Babcock-Davis: www.babcockdavis.com/#sle.
 - 3. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 4. Inpro: www.inprocorp.com/#sle.
 - 5. Nystrom, Inc: www.nystrom.com/#sle.
 - 6. Trim-Tex, Inc: www.trim-tex.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, 0.054 inch thick.
 - 2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.

3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Width of Wings: 1 inches.
 5. Corner: Square.
 6. Color: As selected from manufacturer's standard colors.
 7. Length: One piece.
 8. Preformed end caps.
- B. Adhesives and Primers: As recommended by manufacturer.
 - C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.
 - D. See Section 06 10 00 for wood blocking for wall and corner guard anchors.
 - E. See Section 09 21 16 for supports in stud wall construction.

2.04 FABRICATION

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

2.05 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches above finished floor to ceiling.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 28 00 TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Electric hand/hair dryers.
- D. Diaper changing stations.
- E. Utility room accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Concealed supports, included in wall framing and plates.
- B. Section 06 10 00 - Rough Carpentry: Concealed supports, included in wall framing and plates.
- C. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.
- D. Section 10 21 13.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- H. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- J. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
- K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
- D. Maintenance Materials: Furnish the following for District's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Tools: One each of every special tool required for maintenance of fasteners and operable parts.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Provide toilet accessories meeting the requirements for the physically disabled of the California Building Code (CBC), Title 24 Part 2, and 2010 ADA Standards, as amended.
- B. Accessible requirements:
 - 1. Elements of sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.
 - 2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609.
 - a. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges.
 - b. The space around the grab bars shall be as follows:
 - 1) 1-1/2 inches between the grab bar and the wall. CBC Section 11B-609.3.
 - 2) 1-1/2 inches minimum between the grab bar and projecting objects below and at the ends.
 - 3) 12 inches minimum between the grab bar and projecting objects above.
 - 3. Toilet accessories required to be accessible shall be mounted with any operable part at maximum 40 inches above the finish floor. CBC Section 11B-603.5.
 - 4. The grab bar shall not project more than 3 inches into the 48 inches minimum clear space required required in front of the water closet. CBC 11B-609.3.
 - 5. Toilet tissue dispensers are to be continuous flow type. CBC Section 11B-604.7.
 - 6. All other accessories shall not project more than 4 inches from wall surface, but cannot encroach into any required clear space.

2.02 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:

1. ASI - American Specialties, Inc: www.americanspecialties.com.
 2. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
 3. Bradley Corporation: www.bradleycorp.com.
 4. Gamco: www.gamcousa.com.
 5. Georgia-Pacific Professional: www.blue-connect.com.
 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Provide products of each category type by single manufacturer.

2.03 PRODUCT APPLICATIONS (BASIS OF DESIGN)

- A. **Multi-Occupant with accessible toilet compartment(s):**
1. Framed Mirrors (sizes as indicated on Drawings)
 - a. Channel Frame Glass B-165
 2. Toilet Tissue Dispenser, recessed B-3888 (multi-roll, continuous flow)
 3. Toilet Tissue Dispenser (Standard stalls) B-2888 (multi-roll, Surface Mounted)
 4. Recessed Mounted Sanitary Napkin Disposal B-353
 5. Surface Mounted Seat Cover Dispenser B-221
 6. Soap Dispenser (Liquid), Surface Mounted B-2111
- B. **General:**
1. Grab Bars 1-1/2 inches B-6806.99
 2. Protection for Disabled-Person at lavatories: LavGuard2 manufactured by Truebro, Inc.
 3. Clothes Hook B-2116
 4. Electric Hand Dryers SLIMdri Series Hand Dryer
- C. **Maintenance:**
1. Mop Rack (length as indicated on Drawings) B-224

2.04 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- E. Adhesive: Two component epoxy type, waterproof.
- F. Fasteners, Screws, and Bolts: Stainless steel except where fully concealed may be hot dip galvanized; tamper-proof; security type.

- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.05 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.06 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted.
 - 1. Basis of Design Product: B-2888 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- B. Toilet Paper Dispenser: Double roll, semi-recessed, stainless steel unit with pivot hinge.
 - 1. Basis of Design Product: B-3888 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- C. Soap Dispenser: 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 gage refill indicator.
 - 1. Minimum Capacity: 40 ounces.
 - 2. Basis of Design Product: B-2111 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
 - 1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 - 2. Size: As indicated on drawings.
 - 3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 5. Basis of Design Product: B-165.2436 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
 - 1. Minimum capacity: 250 seat covers.
 - 2. Basis of Design Product: B-221 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- F. Grab Bars: Stainless steel, peened surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin, with peened gripping surface (suffix.99).

- d. Length and Configuration: As indicated on drawings.
 - 1) Minimum Length for Side Wall of Water Closet: 48 inches.
 - 2) Minimum Length for Rear Wall of Water Closet: 42 inches.
 - e. Basis of Design Product: Snap Flange B-6806 Series as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- G. Clothes Hook and Bumper: Satin stainless steel clothes hook.
 - 1. Mounting: Concealed wall plate.
 - 2. Basis of Design Product: B-2116 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- H. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Basis of Design Product: B-353 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.

2.07 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Under-Lavatory Pipe and Supply Covers:
 - 1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 - 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
 - 3. Construction: 1/8 inch flexible PVC.
 - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - b. Comply with ASTM C1822, type indicated.
 - c. Comply with ASME A112.18.9.
 - d. Microbial and Fungal Resistance: Comply with ASTM G21.
 - 4. Color: White.
 - 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
 - 6. Products:
 - a. Bobrick Washroom Equipment, Inc.; www.bobrick.com.
 - b. Bradley Corporation : www.bradleycorp.com.
 - c. IPS Corporation Lav Guard 2 Undersink Pipe Covers: www.ipscorp.com.
 - d. IPS Corporation TrueBro Lav Shield: www.ipscorp.com.
 - e. Plumberex Specialty Products, Inc; Plumberex Pro-Extreme: www.plumberex.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
 - 1. Operation: Automatic, sensor-operated on and off.
 - 2. Mounting: Semi-recessed.
 - 3. Cover: Stainless steel with polished finish.

- a. Tamper-resistant screw attachment of cover to mounting plate.
- 4. Air Velocity: 7,000 linear feet per minute, minimum.
- 5. Total Wattage: 2300 W, maximum.
- 6. Runtime as Hand Dryer: 30 seconds, nominal.
- 7. Supply Voltage: 120 V, single phase, 60 Hz, nominal.
- 8. Warranty: 3 years.
- 9. Basis of Design Product: SLIMdri Series Hand Dryer, surface mounted as manufactured by World Dryer, or approved equal.
- 10. Electric Hand Dryer Products:
 - a. Bobrick Washroom Equipment, Inc.; www.bobrick.com.
 - b. Excel Dryer Inc; ThinAir Hand Dryer: www.exceldryer.com/#sle.
 - c. World Dryer; SLIMdri; : www.worlddryer.com.
 - d. Substitutions: Section 01 60 00 - Product Requirements.

2.09 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Stainless steel.
 - 2. Mounting: Recessed.
 - 3. Minimum Rated Load: 250 pounds.
 - 4. Basis of Design Product: KB110-SSRE Horizontal Recessed Mounted Baby Changing Station as manufactured by Koala Kare, or approved equal.

2.10 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 - 4. Length: 36 inches.
 - 5. Basis of Design Product: B-224 as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

- C. Before covering wall framing with gypsum board, examine framing to ensure that backing plates and grab bar mounting kits have been installed behind surface mounted accessories in such positions as to receive all attachment screws.
- D. Verify that pipes, vents, conduits and other construction features do not protrude into rough wall opening space required for recessed accessories.
- E. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- F. Verify that field measurements are as indicated on drawings.
- G. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
 - 1. Exception: Install surface mounted accessories other than grab bars with screws, molly or toggle bolts only to studs or through backing plates attached directly to studs.
 - 2. At combination units placed behind a grab bar set the perimeter trim tight against the backing board.
 - a. Face of this unit shall not project beyond the tile or applied finish face. Maintain the required 1-1/2 inch clearance.
 - b. Coordinate surrounding finish trim with bullnose tile, radius, or sloped profile trim.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 - 1. Grab Bars: As indicated on drawings.
 - a. Adult mounting height to be between minimum 33 inches to maximum 36 inches to top tangent point. CBC 11B-609.4 Position of Grab Bars.
 - 2. Mirrors: 40 inch maximum , measured to bottom of mirrored surface.
 - 3. Seat Cover Dispenser:
 - a. Shall not be located closer than 1-1/2 inches clear of the tangent point of the grab bar.
 - b. If surface mounted and located under the grab bar provide a minimum 5 inches clear under unit for refilling.
 - 4. Clothes Bumper/Coat Hook: 40 to 48 inches. CBC 11B-603.4 Coat hooks, shelves and medicine cabinets
 - 5. Other Accessories: As indicated on drawings.

3.04 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

3.05 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Finishing at recessed fire extinguisher cabinets.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- B. FM (AG) - FM Approval Guide.
- C. Fire Extinguishers Standard: California Fire Code (CFC) section 906.
- D. Title 19 California Code of Regulations.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.
- F. NFPA 10 - Standard for Portable Fire Extinguishers.
- G. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
 - 1. Submit for fire extinguishers and cabinets, and indicate compliance with local and State fire regulations for extinguisher mounting heights and locations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Conform to all requirements of the local and State Fire Marshal. Conform to all applicable requirements of the California Building Code (CBC), CFC, ADA and Title 19 CCR.
 - 1. Fire Extinguisher cabinets must comply with CBC sections 11B-305 Clear floor or ground space, 11B-307 Protruding Objects, 11B-308 Reach Ranges, 11B-309/811.4 Operable Parts, 11B-403 Walking Surfaces, 11B-811.3 Height.
 - 2. Comply with Section 11B-205 Operable Parts and 309 Operable Parts; Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbf (22.2 N) of force. CBC Section 11B-309.4 Operation.
- B. Fire Extinguisher Requirements: Conform to NFPA 10, California Fire Code and Title 19 requirements for portable fire extinguishers.
- C. Current listing by California State Fire Marshal.

2.02 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group; JL Model Cosmic Series: www.activarcpg.com/#sle.
 - 2. Amerex; www.amerex-fire.com.
 - 3. Ansul, Inc. : www.ansul.com.
 - 4. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 5. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 6. Nystrom, Inc: www.nystrom.com/sle.
 - 7. Potter-Roemer: www.potterroemer.com/#sle.
 - 8. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
 - 9. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmopolitan Series: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 4. Nystrom, Inc: www.nystrom.com.
 - 5. Potter-Roemer: www.potterroemer.com/#sle.
 - 6. Strike First Corporation of America: www.strikefirstusa.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage. Fully serviced and tagged.
 - 1. Stored Pressure Operated: Deep Drawn.
 - 2. Class: 2-A: 10B:C.
 - 3. Size: 10 pound.
 - 4. Size and classification as scheduled.
 - 5. Finish: Baked polyester powder coat, color as selected.

2.04 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 and ASTM E119 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed stainless steel sheet; 0.036 inch thick base metal.
 - 2. Basis of Design Product; 6 inch stud: Cosmopolitan Stainless Steel FE Cabinet Trimless 1034PW-W-17-PUCH as manufactured by Activar, or approved equal.
 - 3. Basis of Design Product; 4 inch stud: Cosmopolitan Stainless Steel FE Cabinet Semi-Recessed 1036V17LDVRFE 1-1/2" Square Trim as manufactured by Activar, or approved equal.
 - 4. Basis of Design Product; 3-1/2 inch stud: Cosmopolitan Stainless Steel FE Cabinet Semi-Recessed 1037V17LDVRFE 3" Rolled Trim as manufactured by Activar, or approved equal.
- C. Fire Rated Cabinet Construction: One-hour fire rated, or as required by wall assembly.
 - 1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.
 - 2. Basis of Design Product; 8 inch stud: Cosmopolitan Stainless Steel FXCabinet Trimless 1034D17FX2-W-PUCH as manufactured by Activar, or approved equal.
 - a. Requires minimum 7-1/4 inch from finish face of gypsum board. Can be used with 2 layers of gypsum board and 6 inch metal stud.
 - 3. Basis of Design Product; 6 inch stud: Cosmopolitan Stainless Steel FX2 Fire Rated FE Cabinet Semi-Recessed 1036V17FX2-LDVRFE 1-1/2" Square Trim as manufactured by Activar, or approved equal.
 - 4. Basis of Design Product; 4 inch stud: Cosmopolitan Stainless Steel FX2 Fire Rated FE Cabinet Semi-Recessed 1037V17FX2-LDVRFE 3" Rolled Trim as manufactured by Activar, or approved equal.
- D. Cabinet Configuration: Trimless Recessed type.
 - 1. Size to accommodate accessories.

2. Exterior nominal dimensions of 10-5/8 inch wide by 24 inch high by 6 inch deep. Add 1 inch for fire rated.
 3. Trimless type.
 4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- E. Cabinet Configuration: Recessed type.
1. Size to accommodate accessories.
 2. Exterior nominal dimensions of 13-7/8 inch wide by 27-3/8 inch high by 6 inch deep.
 3. Trim: Flat square edge, with 13-7/8 inch wide face.
 4. Projected Trim: Returned to wall surface, with 3/8 inch projection, and 1.69 inch wide face.
 5. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- F. Cabinet Configuration: Semi-recessed type.
1. Size to accommodate accessories.
 2. Exterior nominal dimensions of 13-7/8 inch wide by 27-3/8 inch high by 6 inch deep.
 3. Trim: Flat rolled edge, with 13-7/8 inch wide face.
 4. Projected Trim: Returned to wall surface, with 3 inch projection, and 1.69 inch wide face.
 5. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- G. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge.
1. Provide manufacturer's option for compliance with Americans with Disabilities Act (ADA) projection criteria and accessible handle.
 2. Latching and locking hardware operable with a single effort by lever-type hardware or other type hardware not requiring ability to grasp opening hardware and not requiring an opening force greater than 5 pounds.
- H. Door Style: Slot glazed style vertical duo-panel with glazing, continuous hinge, roller catch, zinc plated pull handle and cylinder lock.
1. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- I. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- J. Fabrication: Weld, fill, and grind components smooth.
- K. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
- L. Finish of Cabinet Interior: White colored enamel.

2.05 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

1. Where indicated, at Custodial, Mechanical and Electric Rooms, provide surface mounted bracket with retainer straps.
 2. Basis of Design Product: Model 846 as manufactured by Larsen's Manufacturing Company, or approved equal.
 3. Provide brackets with 3-point connection within cabinets and for locations where fire extinguisher is wall-mounted without cabinet.
 - a. Bracket design shall prevent accidental dislodgement of extinguisher.
 - b. Provide size required for type and capacity of specified extinguisher.
- B. Cabinet Signage:....
1. Identify extinguisher locations with red lettered white decals spelling "FIRE EXTINGUISHER INSIDE" applied to wall or exterior door surface outside each room housing a fire extinguisher. Letter size, style and location as selected by Architect, to comply with local fire authority requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

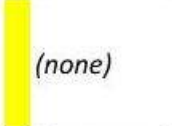
- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets in prepared recesses in walls. Verify recess dimensions for standard non-rated and fire rated where required.
- C. Install cabinets plumb and level in wall openings, 24 inches from finished floor to inside bottom of cabinet.
 1. Cabinet installation shall conform to requirements of the Fire Marshal, CBC, and ADA for location and height of extinguisher.
 2. Place cabinet to position the extinguisher handle at maximum 48 inches AFF.
 3. Place Cabinet 40 inches (1,016 mm) AFF to centerline of cabinet handle.
- D. Secure rigidly in place.
 1. Use oval head fasteners with exposed surfaces of same finish as cabinet.
 2. Fasten cabinets to wood studs with full threaded wood screws or with sheet metal screws.
- E. Maintain acoustical integrity of walls by filling cavity around box with unfaced fiberglass insulation or by applying electrical outlet box acoustical sheeting to the back, top, bottom and sides.
- F. Place extinguishers in cabinets and on wall brackets.
 1. Mount freestanding fire extinguishers on steel brackets on walls at locations indicated on drawings, with fire extinguisher handle located maximum 48-inches above finish floor. Mount steel brackets to solid backing.

2. Mount fire extinguishers to brackets in all cabinets.
3. Place fire extinguishers immediately prior to issuance of "Notice of Completion" or sooner if directed by Fire Marshal or District.

3.03 SCHEDULES

- A. All extinguishers and cabinets shall be quantities and locations as indicated per Drawings or as indicated by field inspection by Fire Marshall.
- B. Place the fire extinguishers based on the allowable maximum travel distance to extinguisher as indicated on Drawing and as follows:
 1. Class A = 75 feet
 2. Class B = 50 Feet
 3. Class C = 50 Feet
 4. Class K = 30 Feet
- C. Multi-Purpose Room: 1 Dry Chemical Type 4A-80BC, 10 lb. capacity, baked enamel finish extinguisher placed in specified cabinet. Ansul Sentry 10 Model No. AA10S.
- D. General Use: 1 Dry Chemical Type 2A-10BC, 10 lb. capacity, baked enamel finish extinguisher placed in specified cabinet. Ansul Sentry 10 Model No. AA10S.
- E. Classroom Use: 1 Dry Chemical Type 2A-10BC, 2.5 lb. capacity, baked enamel finish extinguisher placed in specified cabinet. Ansul Sentry 10 Model No. AA10S.
- F. Vocational Areas: 1 fire blanket, 1 Dry Chemical Type 4A:40B:C JL Industries Galaxy 6, 6 lb. capacity extinguisher, placed in JL Industries Ambassador 1013-G-10 cabinet surface mounted to CMU, 13-11/16 W by 27-3/16 H by 6-1/2 D inches, with vertical lettering.

3.04 TYPES

Fire Class	Geometric Symbol	Pictogram	<u>Intended Use</u>	Mnemonic
A			Ordinary solid combustibles	A for "Ash"
B			Flammable liquids and gases	B for "Barrel"
C			Energized electrical equipment	C for "Current"
D			Combustible metals	D for "Dynamite"
K			Oils and fats	K for "Kitchen"

Fire extinguishing capacity is rated in accordance with ANSI/UL 711: Rating and Fire Testing of Fire Extinguishers.

The ratings are described using numbers preceding the class letter, such as 1-A:10-B:C.

The number preceding the A multiplied by 1.25 gives the equivalent extinguishing capability in gallons of water.

The number preceding the B indicates the size of fire in square feet that an ordinary user should be able to extinguish.

There is no additional rating for class C, as it only indicates that the extinguishing agent will not conduct electricity, and an extinguisher will never have a rating of just C.

END OF SECTION

SECTION 10 51 13

METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lockers.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base construction.
- B. Section 05 05 19 - Post-Installed Concrete Anchors.
- C. Section 05 50 00 - Metal Fabrications.
- D. Section 09 21 16 - Gypsum Board Assemblies: Backing requirements.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
 - 1. Submit with reference to Architect's detail numbers.
 - 2. Indicate lockers in detail, method of installation, fillers, trim, base and accessories, with actual dimensions of lockers for proper layout.
 - 3. Coordinate with available space to install lockers, as per field measurements.
- D. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.
- E. Selection samples: Provide (3) copies of manufacturer's standard color range (8 colors minimum).
 - 1. One of the three copies shall be color on metal samples.
- F. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 JOB CONDITIONS

- A. Sequencing, Scheduling: Verify exact dimensions of room spaces receiving lockers, prior to locker assembly. Coordinate with related work of other Sections. Verify thickened concrete slab installed for bench pedestal supports and concrete bases poured for lockers.
- B. Coordination of Locker Numbering: Arrange to meet with Architect and Construction Manager and coordinate the desired locker numbering sequence for all lockers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.07 GUARANTEE

- A. Locker Manufacturer shall guarantee all lockers and associated materials for the lifetime of ownership of the lockers.
- B. Guarantee shall include and cover all defects in materials and workmanship, excluding the finish and vandalism.
- C. Replace all defective parts at no cost to District.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Provide lockers meeting the requirements for the physically disabled of the California Code of Regulations (CCR), Title 24, Part 2, and ADA Standards, as amended. CBC 11B-225.2.1 and 11B-811.
 - 1. Provide latch and locking hardware that does not require twisting, pinching, or grasping to operate. CBC 11B-309.4.
 - 2. Provide shelf and pole at 48 inches maximum AFF and lower shelf at 15 inches minimum AFF. CBC 11B-308 and 11B-811.3
 - 3. Where lockers are provided, at least 5%, but no fewer than one of each type shall comply with CBC 11B-811.

2.02 MANUFACTURERS

- A. Metal Lockers:
 - 1. DeBourgh Manufacturing Company; Corregidoor Lockers: www.debourgh.com.
 - 2. List Industries, Inc; Superior Fully-Framed All-Welded Team & P.E. Athletic Lockers: www.listindustries.com/#sle.
 - 3. Lyon Workspace Products: www.lyonworkspace.com/#sle.
 - 4. Penco Products, Inc: www.pencoproducts.com/#sle.
 - 5. Republic Storage Systems Co: www.republicstorage.com/#sle.
 - 6. Salsbury Industries: www.lockers.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LOCKER APPLICATIONS

- A. Wardrobe Lockers: Metal lockers, wall mounted for base indicated on drawings.
 - 1. Width: 12 inches.
 - 2. Depth: 21 inches.
 - 3. Height: 72 inches.
 - 4. Configuration: Two tier.

5. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Single shoe shelf.
 - c. Coat rod.
 - d. Hooks: One double prong.
6. Ventilation: Louvers at top and bottom of door panel.
7. Locking: Built-in key locks with spring bolt action.

2.04 METAL LOCKERS

- A. Accessibility: Comply with CBC Chapter 11B and ADA Standards.
- B. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 1. Provide multiple column units to meet job configurations.
 2. Assembly of locker bodies by means of bolts, screws, or rivets are not permitted.
 3. Welding of knockdown locker construction is not acceptable.
 4. Where ends or sides are exposed, provide flush panel closures.
 5. Provide filler strips where indicated, securely attached to lockers.
 6. Color: To be selected by Architect; allow for contrasting colors for locker bodies and doors.
- C. Locker Body: Formed and flanged; with steel stiffener ribs; electric MIG welded.
 1. Body: 13 gage, 0.0897 inch.
 2. Shelves: 16 gage, 0.0598 inch.
 - a. Double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side.
 - b. ADA-Compliant Lockers:
 - 1) Single lockers: Hat shelf maximum 48 inches from locker bottom or lower as required by base condition.
 - 2) Bottom Shelf: Minimum of 15 inches above finish floor for forward and side reach. CBC 11B-308.
 3. Base: 20 gauge, 0.036 inch.
 4. Metal Base Height: 4 inch.
- D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 1. Door Frame: 16 gage, 0.0598 inch, minimum.
- E. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
 1. Door Thickness: 14 gage, 0.0747 inch, minimum.
 2. Form recess for operating handle and locking device.

3. The channel formed by the double bend at the latch side is designed to fully conceal the lock bar.
 4. The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull.
 5. Lock bar shall be hot dip galvanized and installed after paint to ensure proper paint coverage and lock bar operation.
 6. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position.
 7. Provide locking device for use with built-in Key locks.
 8. Latch hooks: 11 gauge (minimum) with riveted bumpers and MIG welded to vertical frame member.
- F. Hinges: Heavy duty, 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.
- G. Trim: 20 gauge, 0.0359 inch.
- H. Coat Hooks: Stainless steel or zinc-plated steel.
- I. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1/2 inch high of block font style with ADA designation, in contrasting color.
- J. Locks: Locker manufacturer's standard type indicated above.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Install end panels, filler panels, and sloped tops.
- F. Install fittings if not factory installed.
- G. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 12 15 00

DISPLAY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Materials required for an art hanging, and display component system.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Support backing in stud walls and ceilings.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting at least 6 weeks prior to the start of the work of this section; require attendance by all affected installers.
 - 1. Determine the weight of the objects to be displayed.
 - 2. The components of the art hanging system have various weight tolerances. Once the weight is known the components needed to carry the weight can be identified.
 - 3. Submit a shop drawing plan indicating the proposed weights, locations and components.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide system, material type, color, composition, and thickness.
- C. Shop Drawings: Indicate proposed weights, locations and components..
- D. Samples: Submit two of each component, 12 x 12 inch in size, illustrating the complete assembly.
- E. Manufacturer's Instructions: Indicate Installation procedure.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Spare Parts: Ten of each kind of hanging components.
 - 3. Tools: One each of every special tool required for maintenance of system.

1.05 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide products by the same manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.06 MOCK-UP

- A. Provide one mock-up of ceiling and wall mounted system, 6 feet long, illustrating all mounting components.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Arakawa Hanging Systems: www.arakawagrip.com
- B. AS Hanging Display Systems: www.ashanging.com.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 APPLICATIONS

- A. Suspended Display System.
- B. Wall Mounted System: Surface mounted
- C. Ceiling Mounted System: Surface mounted

2.03 HANGING AND DISPLAY SYSTEM

- A. Basis of Design Product: Classic Gallery System as manufactured by AS Hanging Display Systems, or approved equal.
- B. Configuration: Tensioned Rod.
 - 1. Wall Track: Open-face.
 - 2. Track Weight Capacity:
 - a. Wall Track: minimum of 300 lbs. per 6 foot track.
 - 3. Vertical Component: Aluminum rods.
 - 4. Include Option: Earthquake zone/preparedness variant and Anti-Theft variant.
- C. Classic Gallery System Wall Track: Aluminum
 - 1. Finish: Anodized.
 - a. Color: To be selected by Architect from custom range.
 - 2. Classic Gallery System Wall Track End Cap: (patented).
 - a. Color: To be selected by Architect from full range.
- D. Vertical Component: 4x4 mm square Rod
 - 1. Rod:
 - a. J-End Aluminum Rod: Minimum weight capacity; 70 lbs.
 - b. Anti-Theft Secure Aluminum Rod: Minimum weight capacity; 70 lbs.

2. Rod-End Hanger (For use with aluminum and stainless P-End rods.) (patented)
3. Rod Length: As indicated on Drawings.
 - a. 12 inches. (Stainless Steel only).
 - b. 24 inches.
 - c. 48 inches.
 - d. 60 inches.
 - e. 72 inches.
 - f. 96 inches.
4. Aluminum Rod Finish:
 - a. Finish: Anodized.
 - 1) Color: To be selected by Architect from custom range.
- E. Hooks: Provide manufacturer's recommended type and quantity of hooks.

2.04 ART DISPLAY RAIL

- A. Basis of Design Product: Casso® Display Rail as manufactured by AS Hanging Display Systems, or approved equal.
- B. Configuration: Wall mounted rail system. Internal wiper to grasp display papers. Display material inserts from below display rail.
 1. Material: Extruded aluminum.
 2. Bulletin bar/ display rail system that eliminates use of:
 - a. Tacks, push pins, staples, and other fasteners for displayed items.
 - b. Rollers to hold displayed items (eliminates binding even with stapled items).
 - c. Hinge type mechanisms.
 3. Extendable on both ends in a continuous installation.
 4. End Caps: Matching finish of extrusion.
 5. Accept variable material thicknesses up to 2mm thick (mat board mounted art).
 6. Mounting:
 - a. Provide manufacturer's fasteners and hardware mounting.
 - b. Shall not have exposed fasteners.
 7. Track Length:
 - a. 24 inches.
 - b. 72 inches.
 8. Finish: Anodized.
 - a. Color: To be selected by Architect from full range.

2.05 ACCESSORIES

- A. Fasteners: As recommended by manufacturer based on the imposed load with a 2.0x factor safety..

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that backing is installed at the correct locations.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch.
- B. Maximum Offset From True Alignment: 1/32 inch.

END OF SECTION

SECTION 12 36 00

COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinetwork.
- B. Wall-hung counters.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.
- B. Section 09 21 16 - Gypsum Board Assemblies: Support framing and concealed blocking.
- C. Division 22 - Plumbing: Sinks.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- F. NEMA LD 3 - High-Pressure Decorative Laminates.
- G. PS 1 - Structural Plywood.
- H. WI (MCP) - Monitored Compliance Program (MCP).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation.
 - 1. Provide the information required by AWMAC/WI (NAAWS) Architectural Woodwork Standards.
 - 2. Provide a Woodwork Institute Certified Compliance Label on the first page of the shop drawings.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

- G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- H. Installation Instructions: Manufacturer's installation instructions and recommendations.
- I. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification: Provide WI (MCP) inspection report and quality certification of completed work.
 - 1. Provide labels or certificates indicating that the installed work complies with AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - a. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
 - b. Provide a Woodwork Institute Certified Compliance Label on each Plastic Laminate, Solid Surface, and Solid Phenolic Core countertop.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - a. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
 - 5. All fees charged by the Woodwork Institute for their Certified Compliance program are the responsibility of the millwork manufacturer and/or installer and shall be included in the bid.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

- B. Correct defective Work within a one year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for material defects.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 - a. Manufacturers:
 - 1) Formica Corporation: www.formica.com.
 - 2) Lamin-Art, Inc: www.laminart.com.
 - 3) Panolam Industries International, Inc.\Nevamar: www.nevamar.com.
 - 4) Panolam Industries International, Inc.\Pionite: www.pionitelaminates.com.
 - 5) Wilsonart: www.wilsonart.com.
 - 6) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. NSF approved for food contact.
 - d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - e. Finish: Matte or suede, gloss rating of 5 to 20.
 - f. Surface Color and Pattern: As indicated on drawings.
 - 2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
 - 3. Back and End Splashes: Same material, same construction.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Avonite Surfaces: www.avonitesurfaces.com.
 - 2) Dupont: www.corian.com.
 - 3) Formica Corporation: www.formica.com.
 - 4) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
 - 5) Wilsonart: www.wilsonart.com.
 - 6) Panolam Industries International, Inc.(Nevamar): www.nevamar.com.

- 7) Substitutions: See Section 01 60 00 - Product Requirements.
- b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
- c. NSF approved for food contact.
- d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
- e. Color and Pattern: As indicated on drawings.
- 3. Other Components Thickness: 1/2 inch, minimum.
- 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; bullnosed edge.
- 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
- 6. Skirts: As indicated on drawings.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
 - 1. Solid Surfacing:
 - a. Adhesive: Neoprene-based panel adhesive or Type I solvent-based mastic type, approved for use by the materials manufacturer. At joints, use manufacturers joint adhesive, color matched to material.
- D. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.
- E. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

- A. Fabricate according to Architectural Woodwork Standards Custom Grade.
- B. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- C. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- D. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 - 1. Finish exposed surfaces smooth and polish to a gloss sheen.
 - 2. Radius corners and edges.

3. Cure components prior to shipment, except sheet materials requiring site handling.
- E. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings.
 1. Mounting: Inside wall to side of stud.
 2. Finish: As selected from the manufacturer's standard range.
 3. Counter Support Bracket:
 - a. Basis of Design Product: Inside Wall - Flush Mount or EH-1818 and 2 x 2 x 1/8 inch aluminum angle Cleat Stock as manufactured by Rakks/Rangine Corporation, rakks.com, or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
 1. Verify dimensions by field measurements prior to fabrication.
 2. Base Cabinets: Cabinet units shall be securely fixed to adjoining units and structure.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
- D. Inspect finished surfaces for damage. Do not install until damage materials have been repaired in an acceptable manner or replaced.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Protect finished surfaces against scratches. Apply masking where necessary. Guard against grit, dust, and other trades.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/16 inch in 1/16 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.
 1. Joints between backsplashes and countertops: Seal joints with silicone sealer.

2. Joints Between Adjacent Pieces of Quartz Surfacing:
 - a. Joints shall be flush, tight fitting, level, and neat.
 - b. Securely join with stone adhesive. Fill joints level with quartz surfacing.
 - c. Clamp or brace quartz surfacing in position until adhesive sets.

3.05 CLEANING

- A. Remove masking and excess adhesives and sealants. Clean exposed surfaces.
- B. Clean countertops surfaces thoroughly.

3.06 PROTECTION

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

SECTION 13 31 33.10
SINGLE POST FABRIC SHADE STRUCTURE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: A single, licensed shade structure contractor shall be responsible for the complete design, engineering, fabrication, supply and installation of the work specified herein.
- B. The intent of this specification is to have only one contractor be responsible for the above functions as a design-build scope.

1.02 REFERENCES

- A. AATCC Test Method 183 - Transmittance or Blocking of UV Radiation through Fabric.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- C. AISC 341 - Seismic Provisions for Structural Steel Buildings.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- E. ASTM A1023/A1023M - Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.
- F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- G. ASTM A492 - Standard Specification for Stainless Steel Rope Wire.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- I. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- J. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- K. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- L. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- M. ASTM D2261 - Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).
- N. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.
- O. ASTM D6603 - Standard Specification for Labeling of UV-Protective Textiles.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- Q. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- R. ASTM F436 - Standard Specification for Hardened Steel Washers.
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- T. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

- U. AWS D1.8/D1.8M - Structural Welding Code - Seismic Supplement.
- V. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- W. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Provide data in the form of manufacturing technical data and specifications.
 - 2. Provide a list of at least 3 similar reference projects that have been installed a minimum of 8 years. At least 3 of these projects shall have utilized the same membrane Fabric.
- B. Shop Drawings:
 - 1. Provide minimum 11x17 page size of Division of the State Architect Pre-Approved structural Drawings referencing PC or A number: showing the following:
 - a. Overall site plan with dimensioned location(s) of shade structure.
 - b. Foundation plan for each shade structure.
 - c. Plans and elevations of shade structure with dimensions and material callouts.
 - d. Details of attachments.
 - 2. Provide written Welding Procedures for any shop or field welding.
- C. Samples:
 - 1. Provide fabric samples of a minimum of 7 color options of approved fabric.
 - 2. Provide powder coat color selections for steel.
- D. Certifications:
 - 1. Provide a letter of authorization from fabric manufacture for use of fabric for the application.
 - a. Include California State Fire Marshal approval certificate for fabric.
 - 2. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.
 - 3. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
 - 4. The Tensioned Fabric Structure fabricator shall provide proof of an ongoing written Quality Assurance program for 5 years or more.

1.04 QUALITY ASSURANCE

- A. Special inspection requirements by a Division of the State Architect approved independent inspection agency shall follow and meet the Test and Inspection list as approved by Division of the State Architect. The shop fabrication shall include welding of all steel members and identification of steel and fabric material through mill certification or material testing. Uncertified steel shall be tested to the requirements of CBC Chapter 17A.
- B. All bidders to have a Division of the State Architect pre-approved PC number for structural drawings for sizes referenced in this bid at the time of bid.
- C. All bidders shall have at least 5 years experience in the design, engineering, manufacture, and installation of similar scope with a successful construction record of in-service performance as

well as a minimum of 8 years experience in the specific manufacture and installation of Division of the State Architect approved structures and provide written proof of all items per article Submittals.

- D. Design indicated items under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in California.
- E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (IAS AC172).
- F. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.
- G. Welder's Qualifications:
 - 1. Welding shall be performed by certified welders qualified in accordance with procedures specified in applicable referenced AWS standard, using materials, procedures and equipment of the type required for the Work.
 - 2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in accordance with manufacturer's instructions, in a clean, dry, well ventilated area, above ground on blocking, and do not allow materials to become wet, stained, or dirty.
- C. Handle materials so as to protect materials, coatings, and finishes during handling and installation to prevent damage or staining.
 - 1. Handle fabric in accordance with manufacturer's instructions.
 - 2. Use care in handling of fabric to avoid damage to fabric material and coating.
 - 3. Do not damage, crush, or kink cables.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard 10 year fabric warranty.
- C. Provide installer's written 1 year workmanship warranty.
- D. A supplemental warranty from the manufacturer shall be provided for a period of 5 years on fabric and 10 years on the structural integrity of the steel from date of substantial completion.
- E. The warranty shall not deprive the District of other rights the District may have under the provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN MANUFACTURER

- A. USA Shade & Fabric Structures, Inc., Inc; Solana Model 15x15x12 ft: www.usashade.com.

1. Local representative: 50 Kalmus Drive, Costa Mesa CA Attn: Patti Abrecht (949) 466-4592 cell or (714) 427-6981 office, Fax: (714) 427-6982.

2.02 MANUFACTURERS

- A. Shade Systems, Inc. : www.shadesystemsinc.com.
- B. Eide Industries, Inc: www.eideindustries.com.
- C. Shade Comforts, Inc.: www.shadecomforts.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.
 1. Approved equals must be pre-qualified and approved in accordance with Section 01 60 00 - Product Requirements.
 2. Submit product documentation, fabric samples and quality assurance criteria, prior to bid in order to be considered.

2.03 PERFORMANCE REQUIREMENTS

- A. Engineer structures to meet or exceed the requirements of the ASCE 7 and California State Building Code, with the following criteria:

Occupancy	E
Exposure Level	C
Design Loads Per ASCE 7.	
- B. Design Build Scope and Building Codes: Proposed structure shall be DSA approved, or pre-approved PC/A, and conform to the CBC using a minimum wind load based on 115 mph, 3 second gusts, exposure C. All shade structures shall be engineered with a zero wind pass through on the fabric.
 1. Contractor is responsible for submittal and approval by the DSA.
 2. Foundation designs shall be based on CBC, table 1806A.2, soil type 5 (1,500 lbs/sq.ft.)
 3. Concrete shall be tested per Section 01 45 33 - Code-Required Special Inspections, CBC section 1903A and inspected per CBC section 1704A.4.

2.04 SYSTEM DESCRIPTION

- A. Pre-Engineered Package: The proposed structure(s) shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables, fasteners, and installation of structure(s) including foundations.
- B. Selected product for Basis of Design: The structures shall be USA Shade Model - DSA1031414-13; 14'x14'x12' Single Post Pyramid Unit design umbrellas.
- C. The structures shall be DSA Pre-Approved and include engineering drawings and calculations, patterning and fabrication of architectural membrane, structural steel frame, architectural HDPE membrane roof, steel cables, all fasteners, and installation of structure(s) including foundations.

2.05 MATERIALS

- A. Steel:

1. Comply with the requirements of the "American Institute of Steel Construction" (AISC) Specifications and the "American Iron and Steel Institute" (AISI) Specifications for Cold Formed Members.
 2. All galvanized steel tube members of the shade structure shall conform to ASTM A500/A500M Grade B (46Ksi).
 - a. The tube exterior surface shall consist of three complementary coatings:
 - 1) Lead-free zinc coating ranging from 0.60 oz/sq ft to 1.0 oz/sq ft;
 - 2) Conversion coating of 30.0 micrograms/so in to inhibit white rust;
 - 3) Clear organic polymer coating as a final barrier to corrosion.
 - b. The combined corrosion resistance of these three coatings shall have the ability to last 1000 hours of exposure to salt spray fog (ASTM B117) without exceeding a maximum of 5% red rust.
 - c. The tube interior surface shall be 100% coated after welding with zinc rich organic coating with a minimum of 91% zinc powder coating.
 - d. The coating shall then be cured to withstand 650 hours of exposure to salt spray fog (ASTM B117) without exceeding a maximum of 5% red rust.
 - e. All plate products shall comply with ASTM A572/A572M Grade 50.
 3. Welding:
 - a. All welding to conform with American Welding Society Standards and shall be inspected by an AWS/CWI inspector; AWS D1.1/D1.1M for hot rolled, AWS D1.3/D1.3M for sheet/cold formed, AWS D1.8/D1.8M Seismic Supplement.
 - b. All full penetration welds shall be continuously inspected by an independent inspection agency per AWS D1.1/D1.1M and AWS D1.8/D1.8M.
 - c. Shop connections shall be welded unless noted otherwise.
 - 1) Field connections shall be as indicated on the drawings (if required).
 - 2) All fillet welds shall be a minimum of 3/16 inch ER70SX electrodes unless otherwise noted. Either SMAW or GMAW is acceptable.
 - d. Demand Critical Welds (AISC 341, Section A3.4B)
 - 1) Welds designated as demand critical, shall be made with a filler metal capable of providing a minimum Charpy V-Notch (CVN) toughness of 20 ft-lb at -20 degrees F and 40 ft-lb at 70 degrees F, when the steel maintained at a temperature of 50 degrees F or higher.
 - 2) For structures with service temperatures lower than 50 degrees F, the qualification temperature shall be 20 degrees F above the lowest anticipated service temperature, or at a lower temperature.
- B. Bolts:
1. All high strength bolts shall comply with ASTM A325 grade BD.
 2. All nuts shall comply with ASTM A563 DH, and washers shall comply with ASTM F436.
 3. All high strength bolts shall be tightened to a snug tight condition.
- C. Finish:
1. All structural steel shall be painted with one shop coat (2.5 to 3.5 mils thick min).
 - a. This coat is a weather resistant powder coating based on polyester TGIC (manufactured by Sherwin Williams or Tiger Drylac).

- b. To achieve optimum adhesion, it is recommended that the proper treatment and drying take place before coating.
 - c. Polyester powder (TGIC) specifications shall be as follows:
 - 1) Pencil Hardness (ASTM D3363).
 - 2) Humidity (ASTM D2247).
 - 3) Solvent Resistance (PCI method) -- 50 double rubs SL. Softness.
- D. Fabrication:
 - 1. Fabrication of the steel structures shall be performed by manufacturer or an authorized licensee.
 - 2. Material testing (or mill certificates) and inspection of welding shall be conducted per CBC Sections 1704A, 1705A, 1705A.2, and table 1705A.2.I.
 - 3. The structural members shall be fabricated in as large segments as possible to minimize field joints.
 - 4. All segments of the assembly will be welded or stamped with the appropriate part number in a manner that will still be visible after powder coating is applied.
 - 5. Grind all corners and sharp edges.
 - 6. All steel connections shall have a maximum internal sleeving tolerance of 0.0625 inch using high tensile strength steel sections with a minimum sleeve length of 6 inches.

2.06 FOOTING

- A. Base Type:
 - 1. Recess Base Plate: Center column attached to a steel base plate with anchor bolts embedded in footing.
- B. Concrete shall be tested and inspected per CBC Section 1903A.
- C. Concrete to be $f'c = 3,000$ psi per ACI 318 chapter 5, reinforcing steel to be $f_y = 60,000$ psi, minimum grade 60.
- D. All anchor bolts set in new concrete (when applicable) shall comply with ASTM F1554 Grade 55 (galvanized).
 - 1. Anchor bolts embedment needs to be as follow:
 - a. Anchor bolt 7/8 inch diameter, 24 inches minimum embedment.
- E. Certified mill test reports are to be provided for each shipment of reinforcement.

2.07 CABLES AND FITTINGS

- A. Fabric Attachment: 1/4 inch 7x19 galvanized cable per ASTM A1023/A1023M.
 - 1. Cable shall be tensioned to 250 lbs. minimum.
- B. Cables shall be fed through the fabric sleeves around the perimeter of the canopy and tensioned until the fabric panels (designed purposely undersized) reach a taut appearance.
 - 1. Any long term cable sag shall be minimized during the maintenance re-tightening visits as required.
- C. Stainless Steel Cables and Fittings:
 - 1. Cables shall be 1x19 Stainless Steel Open Strands, ASTM A492, Grade 316.

2. Cables and fittings will be fabricated per the standard operating procedures of the manufacturers.
3. Attach a tag indicating the cable length and mark number to each cable assembly.
4. Cables shall be tensioned to double the design load before length is cut.
5. Cables shall be tensioned to the design load when measuring the cut length that is indicated on the shop drawings.

2.08 FABRIC ROOF SYSTEM

- A. Product: "Colourshade FR" Fabric shall be manufactured by Multiknit Ltd.
 1. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabric: UV stabilized high-density polyethylene.
 1. Mesh shall be rachel knitted with monofilament and tape yarn filler to ensure that material will not unravel if cut.
 2. Minimum Panel Width: 10 feet.
- C. Ultimate tensile capacity when tested per ASTM D5034:
 1. Warp direction of 100 lbs per inch at 66% maximum elongation.
 2. Fill direction of 50 lbs per inch at 33% maximum elongation.
 3. Across seams of stitching of 80 lbs per inch at 80% maximum elongation.
- D. Average tearing strength, when tested per ASTM D2261:
 1. Warp direction of 14 lbs.
 2. Fill direction of 11.5 lbs.
- E. The fabric shall retain 80% of its tensile and tearing strength after ultraviolet exposure per ASTM G154 using a 313 nm light source for 500 hours while moistened for 1 hour every 12 hours.
- F. Provide certification by manufacturer and State Fire Marshall to DSA at site specific installation.
- G. Fabric shall require annual inspection and maintenance.
 1. Fabric samples of the same material which are maintained at the projects site shall be tested to be in compliance with ASTM D5034 and ASTM D2261.
 2. The annual testing on the approved plans shall be compared to the ultimate tensile capacity fabric specifications noted above.
 3. Fabric shall be replaced when the test results return less than 50% of the ultimate tensile capacity fabric specifications noted above..
 4. Maintenance:
 - a. Removal:
 - 1) Fabric top to be removed if snow exceeding 5 psf are anticipated,
 - 2) Fabric top to be removed if winds exceeding 115 mph are anticipated.
 - b. Reinstallation:
 - 1) Visual inspection is required, looking for tear and abnormal wear in fabric material and thread is required prior to re-installation.

- 2) Manufacturer shall be notified if significant damage is present before re-installation.
- H. Fabric shall meet the following fire resistance tests:
 1. ASTM E84.
 2. NFPA 701 (Weathered or un-weathered).
 3. CA Fire Marshall Rating (Reg. # FA-52001).
 - I. Fabric shall meet the U.S. Standards for testing and labeling of UV Protective textiles ASTM D6603 and AATCC Test Method 183.
 - J. Stitching & Thread:
 1. All sewing threads are to be double stitched.
 2. Thread shall be GORE Tenara Sewing Thread manufactured from 100% expanded PTFE; mildew resistant exterior approved thread. Thread shall meet or exceed the following:
 - a. Flexible temperature range
 - b. Very low shrinkage factor
 - c. Extremely high strength, durable in outdoor climates
 - d. Resists flex and abrasion of fabric
 - e. Unaffected by cleaning agents; acid rain, mildew, salt water and rot resistant, unaffected by most industrial pollutants.
 - f. Treated for prolonged exposure to the sun.
 - K. Color: Color shall be as scheduled on Drawings or as selected by Architect from the manufacturer's standard color chart.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Field Measurements: Verify layout information for shade structures shown on the Drawings in relation to the property survey and existing structures, and verify locations by field measurements prior to construction.
- B. Correct unsatisfactory conditions before proceeding with installation.

3.02 PREPARATION

- A. Installation of shade structures shall be performed by manufacturer certified installers experienced in tension fabric structures.
 1. Installation shall be performed in strict accordance with manufacturer's instructions for assembly, installation, and erection per approved drawings.
- B. Manufacturer shall prepare a full and comprehensive assembly procedure guide prior to installation.

3.03 ERECTION

- A. Weather Conditions:

1. Proceed with installation of the fabric and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers recommendations.
 2. The Tensioned Fabric Structure shall not be installed when wind conditions are deemed in excess of manufacturer's determination of safe wind speed erection conditions.
 3. It shall be the manufacturer's sole discretion to determine acceptable and safe wind condition for installation.
- B. Framing and structural members:
1. Accurately set anchor bolts.
 2. Uniform bearing under base plates shall be provided using non shrink grouting compound where applicable.
 3. Members shall be accurately set to assure proper fitting and covering.
 4. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses.
 5. Erected structural frame work shall be adequately guyed and secured to resist all possible loads due to wind and the installation process.
- C. Fabric:
1. Prior to start of installation; check all surfaces of framing members and other rigid construction elements to be in contact with fabric to ensure that all edges are smooth and well rounded.
 2. Remove any potential causes for snagging or tearing of the fabric.
 3. Properly install all connections and provide all materials and equipment required for the erection and stressing of the fabric.
 4. Unroll the fabric in such a manner as to avoid snagging or dragging the fabric over sharp objects during installation.
 5. Adequate fabric prestress shall be confirmed by the fabric structure manufacturer and the appearance of the fabric membrane roof shall be smooth and wrinkle free.
 6. Creasing or folding the fabric around sharp corners shall be avoided at all times.
- D. Fabric tensioning system:
1. Cables shall be free of all kinks and bends.
 2. Care shall be taken not to damage the cables during installation.
 3. Bolt holes shall be 1/16 inch larger than the bolt, unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Shop fabrication inspection shall include welding of all steel members and identification of steel through mill certificate or material testing.
1. Uncertified steel shall be tested to the requirements of CBC chapter 17A.
- B. Field special inspection shall include compression cylinder tests for the concrete foundation.

3.05 ADJUSTING

- A. Restore marred or abraded surfaces to original condition using same paint or coating as factory-applied finishes, when the results are acceptable to the Architect, otherwise replace damaged item.

END OF SECTION

SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.
- C. Fire department connections.
- D. Materials furnished and installed in this section but wired by others:
 - 1. Valve supervisory devices shall be furnished and installed by the sprinkler subcontractor but wired by the alarm subcontractor.
 - 2. Waterflow switches shall be furnished and installed by the sprinkler contractor but wired by the alarm contractor.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting: Painting of finished surfaces at pipe penetrations by other than installing sprinkler subcontractor.
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- D. Division 26 - Electrical: Electrical characteristics and wiring connections.
- E. Section 28 30 00 - Fire Alarm System.

1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide.
- B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- E. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- F. NFPA 1963 - Standard for Fire Hose Connections.
- G. UL (DIR) - Online Certifications Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Contractor to furnish all equipment, materials, tools, labor, engineering, drawings, etc. necessary for a complete fire protection system, with said systems being made ready for operation in accordance with the requirements of the Division of the State Architect.
 - 1. The purpose of the permit drawings and specifications is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust, and make operable.

2. Any omission by the District of any necessary system component as required by the Division of the State Architect, in the specifications shall not relieve the Contractor of the responsibility for providing such necessity, without additional cost to the District.
 - a. No extra payments will be allowed to the Contractor as a result of extra work made necessary by his failure to do so.
 3. The Contractor shall visit the site before submitting his bid and shall examine all existing physical conditions that may be material to the performance of his work.
 4. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the District, Architect, and Engineer for clarification prior to the bid due date.
- B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
 3. Submit shop drawings to Authority Having Jurisdiction and Fire Marshall for approval. Submit proof of approval to Architect.
- D. Samples: Submit two of each style of sprinkler specified.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
 3. Sprinkler Wrenches: For each sprinkler type.
- J. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.

- B. Comply with FM (AG) requirements.
- C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in California.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- E. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience and approved by manufacturer.
- F. Equipment and Components: Provide products that bear FM (AG) label or marking.
- G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Tyco Fire Protection Products, a Tyco Business: www.tyco-fire.com.
 - 2. Viking Corporation: www.vikinggroupinc.com.
 - 3. Existing manufacturer's of equipment on site..
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for building areas noted.
- B. Occupancy: Ordinary hazard, Group 1; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
 - 1. If test data is not available assume 2500 gpm at static 65 psig.
 - 2. Revise design when test data available prior to submittals.
- D. Interface system with building control system.
- E. Provide fire department connections where indicated.
- F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- G. Pipe Hanger Fasteners: Attach hangers to walls structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 - 4. Other Types: As required.

2.03 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Standard.
 - 2. Coverage Type: Standard.
 - 3. Finish: Enamel, color as selected.
 - 4. Escutcheon Plate Finish: Enamel, color as selected.
 - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Standard type with guard.
 - 1. Response Type: Standard.
 - 2. Coverage Type: Standard.
 - 3. Finish: Chrome plated.
 - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
 - 1. Response Type: Standard.
 - 2. Coverage Type: Standard.
 - 3. Finish: Enamel, color as selected.
 - 4. Escutcheon Plate Finish: Enamel, color as selected.
 - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Storage Sprinklers: Pendant type with guard.
 - 1. Response Type: Standard.
 - 2. Coverage Type: Standard.
 - 3. Finish: Chrome plated.
 - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- E. Guards: Finish to match sprinkler finish.
- F. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.
 - 1. Finish: Brass.
- G. Flexible Drop System: Stainless steel, multiple use, open gate type.
 - 1. Application: Use to properly locate sprinkler heads.
 - 2. Include all supports and bracing.
 - 3. Provide braided type tube as required for the application.
 - 4. Manufacturers:
 - a. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 - 1. Activate electric alarm.
 - 2. Test and drain valve.
 - 3. Replaceable internal components without removing valve from installed position.
- B. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- C. Test Connections:
 - 1. Backflow Preventer Test Connection:
 - a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.
 - b. Furnish one valve for each 250 gpm of system demand or fraction thereof.
 - c. Provide permanent sign reading "Test Valve" in accordance with Section 22 05 53.
- D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.
- E. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.
- F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- G. Fire Department Connections:
 - 1. Type: Exposed, projected wall mount made of corrosion resistant metal complying with UL 405.
 - a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
 - b. Outlet: Back with pipe threads, 4 NPS.
 - c. Rated Working Pressure: 175 psi.
 - d. Finish: Chrome.
 - e. Signage: Raised or engraved lettering 1 inch minimum indicating system type.
 - f. Manufacturers:
 - 1) Elkhart Brass Manufacturing Company, Inc: www.elkhartbrass.com.
 - 2) Fire End & Croker Corporation: www.croker.com.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.

- D. Provide approved double check valve assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Locate outside alarm gong on building wall as indicated.
- G. Place pipe runs to minimize obstruction to other work.
- H. Place piping in concealed spaces above finished ceilings.
- I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- K. Flush entire piping system of foreign matter.
- L. Install guards on sprinklers in storage areas and where selected by Architect and Owner.
- M. Hydrostatically test entire system.
- N. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 05 17
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- C. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.02 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. Metraflex Company (The).
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Presealed Systems.
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.04 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."

- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.04 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Interior Partitions:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.

END OF SECTION

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SECTION 22 05 18
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

3.02 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 19
METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Thermowells.
 - 4. Dial-type pressure gages.
 - 5. Test plugs.
- B. Related Sections:
 - 1. Division 22 Section " Domestic Water Piping" for water meters inside the building.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Trerice, H. O. Co.
 - 2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 3. Weiss Instruments, Inc.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch (76-mm) nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).

- E. Connector Type(s): Union joint, rigid, back and rigid, bottom, with unified-inch screw threads.
- F. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

2.02 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Terrice, H. O. Co.
 - b. Weiss Instruments, Inc.
 - c. Or approved equal.
 - 2. Standard: ASME B40.200.
 - 3. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
 - 4. Case Form: Straight unless otherwise indicated.
 - 5. Tube: Glass with magnifying lens and blue or red organic liquid.
 - 6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
 - 7. Window: Glass.
 - 8. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 9. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
 - 10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.03 THERMOWELLS

- A. Thermowells:
 - 1. Standard: ASME B40.200.
 - 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 - 3. Material for Use with Copper Tubing: CNR.
 - 4. Material for Use with Steel Piping: CRES.
 - 5. Type: Stepped shank unless straight or tapered shank is indicated.
 - 6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.

7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
 8. Bore: Diameter required to match thermometer bulb or stem.
 9. Insertion Length: Length required to match thermometer bulb or stem.
 10. Lagging Extension: Include on thermowells for insulated piping and tubing.
 11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.04 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMETEK, Inc.; U.S. Gauge.
 - b. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - c. Weiss Instruments, Inc.
 2. Standard: ASME B40.100.
 3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.
 4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 6. Movement: Mechanical, with link to pressure element and connection to pointer.
 7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
 8. Pointer: Dark-colored metal.
 9. Window: Glass.
 10. Ring: Metal.
 11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.05 TEST PLUGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Terice, H. O. Co.
 2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 3. Weiss Instruments, Inc.
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.

- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install test plugs in piping tees.
- K. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
- L. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.

3.02 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.03 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Direct-mounted, metal-case, vapor-actuated type.
 - 3. Industrial-style, liquid-in-glass type.
 - 4. Direct-mounted, light-activated type.
 - 5. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

- B. Thermometer stems shall be of length to match thermowell insertion length.

3.05 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 150 deg F (Minus 20 to plus 70 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F (0 to 150 deg C).

3.06 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
 - 1. Liquid-filled, direct -mounted, metal case.
 - 2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 - 1. Liquid-filled Solid-front, pressure-relief, direct-mounted, metal case.
 - 2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
 - 2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

3.07 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 160 psi (0 to 1100 kPa).

END OF SECTION

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SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.
 - 2. Bronze swing check valves.
 - 3. Lubricated plug valves.
- B. Related Sections:
 - 1. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
 - 2. Section 22 11 16 "Domestic Water Piping" for valves applicable only to this piping.
 - 3. Section 22 13 19 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.03 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.05 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
 - 2. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.
- E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRONZE BALL VALVES

- A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
2. Description:
- a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Three piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.03 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 300 psig (2070 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.

2.04 LUBRICATED PLUG VALVES

A. Class 125, Cylindrical, Lubricated Plug Valves with Threaded Ends:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Homestead Valve; a division of Olson Technologies, Inc.
 - b. Milliken Valve Company.

- c. R & M Energy Systems; a unit of Robbins & Myers, Inc.
- 2. Description:
 - a. Standard: MSS SP-78, Type IV.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
 - d. Pattern: Regular or short.
 - e. Plug: Cast iron or bronze with sealant groove.
- B. Class 125, Cylindrical, Lubricated Plug Valves with Flanged Ends:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Homestead Valve; a division of Olson Technologies, Inc.
 - b. Milliken Valve Company.
 - c. R & M Energy Systems; a unit of Robbins & Myers, Inc.
 - 2. Description:
 - a. Standard: MSS SP-78, Type IV.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
 - d. Pattern: Regular or short.
 - e. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.

- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Plate-Type Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.03 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, valves.
 - 2. Throttling Service: Globe or ball valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with disc.
 - b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Bronze swing check valve with bronze disc.
 - c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Bronze swing check valve with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.05 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG (1035 kPa) OR LESS)

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Three piece, full port, bronze with stainless-steel trim.
 - 3. Bronze Lift Check Valves: Class 125, bronze disc.
 - 4. Bronze Swing Check Valves: Class 125, bronze disc.

END OF SECTION

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SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Fastener systems.
 - 5. Equipment supports.
- B. Related Sections:
 - 1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.03 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

- 1. Trapeze pipe hangers.
- 2. Metal framing systems.
- 3. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.07 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.02 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-Line, Inc.
 - b. Flex-Strut Inc.
 - c. Unistrut Corporation; Tyco International, Ltd.
 - 2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
 - 3. Standard: MFMA-4.

4. Channels: Continuous slotted steel channel with intumed lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Vinyl.
9. Plastic Coating: PVC.

2.04 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- C. High-Type, Single-Pipe Stand:
 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 2. Base: Stainless steel.
 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- D. High-Type, Multiple-Pipe Stand:
 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 2. Bases: One or more; plastic.
 3. Vertical Members: Two or more protective-coated-steel channels.
 4. Horizontal Member: Protective-coated-steel channel.
 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- E. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.06 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.07 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 23 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 13. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

15. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
 16. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 17. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 18. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

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SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Pipe-riser resilient supports.
 - 2. Restraint channel bracings.
 - 3. Restraint cables.
 - 4. Seismic-restraint accessories.
 - 5. Mechanical anchor bolts.

1.03 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
 - 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.
- B. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For professional engineer.

- C. Welding certificates.
- D. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: 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 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the CBC 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 and shall bear anchorage preapproval OPM number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Assigned Seismic Use Group or Building Category as Defined in the CBC: II.
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 2.5.
 - c. Component Amplification Factor: 2.5.
 - 2. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.02 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hilti, Inc.
 - 3. Mason Industries, Inc.
- 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 and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hilti, Inc.
 - 3. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in 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 E 488.

PART 3 - EXECUTION

3.01 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 of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. 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 due to seismic forces.
- B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION CONTROL AND 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 03 30 00 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 3. Brace a change of direction longer than 12 feet (3.7 m).
- D. Install cables so they do not bend across edges of adjacent equipment or building structure.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. 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.
- H. 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.
- I. 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. Heavy-duty 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.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 22 11 16 "Domestic Water Piping" for piping flexible connections.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. 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 postconnection 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.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

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SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.04 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 4. Fasteners: Stainless-steel rivets.
 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Green.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.

- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.04 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.
 - 1. Stencil Material: Aluminum.
 - 2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.05 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
 - 1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.06 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches (100 by 178 mm).
 - 2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Section 09 91 23 "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.
 1. Identification Paint: Use for contrasting background.
 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Pipe Label Color Schedule:
 1. Low-Pressure, Compressed-Air Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.
 2. Domestic Water Piping:
 - a. Background Color: Green.

- b. Letter Color: White.
- 3. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.

3.04 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches (38 mm), round.
 - b. Hot Water: 1-1/2 inches (38 mm), round.
 - c. Low-Pressure Compressed Air: 1-1/2 inches (38 mm), round.
 - 2. Valve-Tag Color:
 - a. Cold Water: Green.
 - b. Hot Water: Green.
 - c. Low-Pressure Compressed Air: Blue.
 - 3. Letter Color:
 - a. Cold Water: White.
 - b. Hot Water: White.
 - c. Low-Pressure Compressed Air: White.

3.05 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

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SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
 - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.
- D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
 - 1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
 - 2. Jacket Materials for Pipe: 12 inches long by NPS 2.
 - 3. Sheet Jacket Materials: 12 inches square.

4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
 1. Piping Mockups:
 - a. One 10-foot section of NPS 2 straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
 - e. Four support hangers including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.

4. Obtain Architect's approval of mockups before starting insulation application.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed.
- D. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.07 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.08 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Pittsburgh Corning Corporation; Foamglas.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Manson Insulation Inc.; Alley Wrap.
- I. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000-Degree Pipe Insulation.
 - c. Manson Insulation Inc.; Alley-K.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.03 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.04 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.

2.05 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
- b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
- c. Vimasco Corporation; 713 and 714.
- 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
- 4. Service Temperature Range: 0 to plus 180 deg F.
- 5. Color: White.

2.06 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.07 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

2.08 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 - 2. Width: 2 inches.
 - 3. Thickness: 6 mils.
 - 4. Adhesion: 64 ounces force/inch in width.
 - 5. Elongation: 500 percent.
 - 6. Tensile Strength: 18 lbf/inch in width.

2.09 SECUREMENTS

- A. Bands:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
 - 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with closed seal.
 - 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.

2.10 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGuire Manufacturing.
 - b. Plumberex.
 - c. Truebro; a brand of IPS Corporation.
 - d. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 - 2. Description: Manufactured plastic wraps for covering plumbing fixture hot-water supply and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 - 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.04 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
- F. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.

3.05 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 3. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 4. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.06 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.
- C. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.07 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- C. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.09 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water:
 - 1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

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SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

1.03 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.04 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.05 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.02 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint.

2.03 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet.
- C. Color: Natural.

2.04 TRANSITION FITTINGS

- A. General Requirements:
 1. Same size as pipes to be joined.
 2. Pressure rating at least equal to pipes to be joined.
 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).

2.05 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
 - b. Watts; a division of Watts Water Technologies, Inc.
 - c. Wilkins; a Zurn company.
 2. Standard: ASSE 1079.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Nipples:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elster Perfection Corporation.
 - b. Grinnell Mechanical Products; Tyco Fire Products LP.

- c. Precision Plumbing Products, Inc.
- d. Victaulic Company.
- 2. Standard: IAPMO PS 66.
- 3. Electroplated steel nipple complying with ASTM F 1545.
- 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
- 5. End Connections: Male threaded or grooved.
- 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Comply with Division 33 requirements for excavating, trenching, and backfilling.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."
- G. Install domestic water piping level without pitch and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.03 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.04 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.05 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.06 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.

3.07 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.08 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.09 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 4 and smaller, shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Backflow preventers.
 - 2. Balancing valves.
 - 3. Strainers.
 - 4. Hose bibbs.
 - 5. Wall hydrants.
 - 6. Drain valves.
 - 7. Water hammer arresters.
 - 8. Trap-seal primer valves.
- B. Related Sections include the following:
 - 1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 - 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.01 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Woodford Manufacturing Company.
 - b. Zurn Plumbing Products Group; Wilkins Div.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. MIFAB, Inc.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.02 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FEBCO; SPX Valves & Controls.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Body: Bronze for and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for and larger.
5. End Connections: Threaded.
6. Configuration: Designed for horizontal, straight through flow.
7. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Woodford Manufacturing Company.
2. Standard: ASSE 1052.

3. Operation: Up to back pressure.
4. Inlet Size: 3/4".
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least flow.

2.03 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
 - a. Taco, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. NIBCO INC.
4. Type: Ball valve with two readout ports and memory setting indicator.
5. Body: Bronze,
6. Size: Same as connected piping, but not larger than.
7. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.04 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: minimum, unless otherwise indicated.
2. Body: Bronze for and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for and larger.
3. End Connections: Threaded and smaller; flanged for and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.05 HOSE BIBBS

A. Hose Bibbs HB-1

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc,
 - c. Zurn Plumbing Products Group; Light Commercial Operation
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.

4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 3/4 (DN 20) threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig (860 kPa).
8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Rough bronze.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Operating key.
14. Operation for Finished Rooms: Operating key.
15. Include operating key with each operating-key hose bibb.
16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.06 DRAIN VALVES

- A. Ball-Valve-Type, Hose-End Drain Valves:
 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
 2. Pressure Rating: minimum CWP.
 3. Body: Copper alloy.
 4. Ball: Chrome-plated brass.
 5. Seats and Seals: Replaceable.
 6. Handle: Vinyl-covered steel.
 7. Inlet: Threaded or solder joint.
 8. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.07 WATER HAMMER ARRESTERS

- A. Water Hammer Arresters WHA-1:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - b. PPP Inc.
 - c. MIFAB, Inc.
 2. Standard: ASSE 1010 or PDI-WH 201.
 3. Type: Copper tube with piston.
 4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.08 TRAP-SEAL PRIMER VALVES

- A. Supply-Type (Single), Trap-Seal Primer Valves TP-1:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - 2. Standard: ASSE 1018.
 - 3. Pressure Rating: minimum.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: threaded, union, or solder joint.
 - 6. Gravity Drain Outlet Connection: threaded or solder joint.
 - 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Trap-Type (Single), Trap-Seal Primer Valves PT-1:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - 2. Standard: ASSE 1018.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: ground joint connection and escutcheons.
 - 5. Gravity Drain Outlet Connection: threaded or solder joint.
 - 6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install Y-pattern strainers for water on supply side of each solenoid valve, and pump.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.03 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 1. Reduced-pressure-principle backflow preventers.
 2. Double-check backflow-prevention assemblies.
 3. Calibrated balancing valves.
 4. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 23 Section "Mechanical Identification."

3.04 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.05 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.

1.03 DEFINITIONS

- A. PE: Polyethylene plastic.

1.04 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.05 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
- C. Field quality-control inspection and test reports.

1.06 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.03 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, 4 stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) Husky.
 - 2) Clamp-All Corp.
 - 3) Mission Rubber Co.

2.04 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded couplings; and hubless-coupling joints.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded couplings; and hubless-coupling joints.

- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 - 1. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- E. Aboveground, condensate drain piping shall be any of the following:
 - 1. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.

3.02 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 23 Section "Basic Materials and Methods."
- B. Install seismic restraints on piping.
- C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- D. Install underground PVC piping according to ASTM D 2321.
- E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for all piping.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.03 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 23 Section "Basic Mechanical Materials and Methods."
- B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

- C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.04 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
- H. Install supports for vertical [ABS] [and] [PVC] piping every 48 inches (1200 mm).
- I.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.05 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.06 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.07 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.08 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be the following:
 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
- C. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
- D. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be the following:
 1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following plumbing specialties:
 - 1. Water Filters.
 - 2. Cleanouts.
 - 3. Floor drains.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Piping: 125 psig.
 - 2. Sanitary Waste and Vent Piping: 10-foot head of water.

1.04 SUBMITTALS

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
 - 1. Balancing valves, water filters, and strainers.
 - 2. Thermostatic water mixing valves and water tempering valves.
 - 3. Water hammer arresters, air vents, and trap seal primer valves and systems.
 - 4. Drain valves, hose bibbs, hydrants, and hose stations.
 - 5. Sleeve penetration systems.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field test reports.
- D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:
 - 1. Water filters.
 - 2. Thermostatic water mixing valves and water tempering valves.
 - 3. Trap seal primer valves and systems.

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
 - 2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Water Filter Cartridges: Equal to 200 percent of amount installed for each type and size indicated.
 - 2. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 WATER FILTERS

- A. Manufacturers:
 - 1. Filtrine Manufacturing Company; Drinking Water Division.
 - 2. Osmonics.
 - 3. PURA, Inc.
 - 4. U.S. Filter; Filterite Div.
 - 5. Watts Industries, Inc.; Water Products Div.

- B. General: Cartridge-type assemblies suitable for potable water. Include housing, fittings, filter cartridges, and cartridge end caps.

2.03 CLEANOUTS

- A. Cleanouts, WCO: Comply with ASME A112.36.2M or ASME A112.3.1.
 - 1. Application: Wall cleanout.
 - 2. Products:
 - a. Josam Co.
 - b. Smith, Jay R. Mfg. Co.
 - c. Zurn Industries, Inc., Specification Drainage Operation
 - 3. Body or Ferrule Material: Cast iron.
 - 4. Clamping Device: Required.
 - 5. Outlet Connection: Threaded.
 - 6. Closure: Brass plug with straight threads and gasket.
 - 7. Adjustable Housing Material: Cast iron with threads.
 - 8. Frame and Cover Material and Finish: Polished bronze.
 - 9. Frame and Cover Shape: Round.

2.04 FLOOR DRAINS

- A. Floor Drains, FD-1: Comply with ASME A112.21.1M.
 - 1. Application: Shower drain.
 - 2. Products:
 - a. Josam Co.; Model 30000-Z-A.
 - b. Smith, Jay R. Mfg. Co.; Fig. 2005-A.
 - c. Zurn Industries, Inc., Specification Drainage Operation; Model Z-415.
 - 3. Body Material: Gray iron.
 - 4. Seepage Flange: Required.
 - 5. Clamping Device: Required.
 - 6. Outlet: Bottom.
 - 7. Exposed Surfaces and Interior Lining: Not required.
 - 8. Sediment Bucket: Not required.
 - 9. Top or Strainer Material: Nickel bronze.
 - 10. Top of Body and Strainer Finish: Chrome.
 - 11. Top Shape: Round.
 - 12. Dimensions of Top or Strainer: 5-inches diameter.
 - 13. Top Loading Classification: Light Duty.
 - 14. Trap Material: Cast iron.
 - 15. Trap Pattern: Standard P-trap with trap primer connection.

16. Trap Features: Not required.
17. Provide min. 3-inch waste connection.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- D. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- E. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- F. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- G. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- H. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- I. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

- J. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- K. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipefittings.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 22 Sections.
- D. Ground equipment.
- E. 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 and UL 486B.
- F. Connect plumbing specialties and devices that require power according to Division 26 Sections.

3.03 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer, thermostatic water mixing valve, and trap seal primer system.
 - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 2. Refer to Division 23 Section "Identification for HVAC Piping and Equipment" for nameplates and signs.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.05 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems.

END OF SECTION

SECTION 22 41 00
RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Faucets.
 - 2. Bar sinks.
 - 3. Supply fittings.
 - 4. Waste fittings.
- B. Related Requirements:
 - 1. Section 22 42 13.13 "Commercial Water Closets."
 - 2. Section 22 42 13.16 "Commercial Urinals."
 - 3. Section 22 42 16.13 "Commercial Lavatories."
 - 4. Section 22 47 13 "Drinking Fountains."

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.
- B. Sample Warranty: For special warranty.

1.05 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
 - 3. Toilet Seats: Equal to 5 percent of amount of each type installed.

1.06 DSA NOTES

- A. Accessible plumbing fixtures shall comply with all of the requirements of 2016 CBC Division 6.
- B. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612 and DSA Check List Fig. 15-A.
- C. Fixture controls shall comply with 2019 CBC Sections 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-604.9.5 for children's water closets, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
- D. Each accessible sink shall be a maximum of 6-1/2" deep. Sinks shall be mounted with the counter or rim no higher than 34" above the finish floor. 2019 CBC Section 11B-213.3.
- E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

PART 2 - PRODUCTS

2.01 SINKS

- A. Bar Sinks - Single Bowl, Counter Mounted KS-1:
 - 1. Stainless Steel Bar Sinks:
 - a. Elkay Manufacturing Co.
 - b. Just Manufacturing.
 - c. Or approved equal.
 - 2. Fixture:
 - a. Standard:
 - 1) ASME A112.19.3/CSA B45.4 for stainless steel lavatories.
 - b. Type: Flat rim with ledge.
 - c. Overall Dimensions: 19-inches by 17.5 inches.
 - 3. Faucet: S-1.
 - 4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
 - 5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.02 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Sink Faucets KS-1: Solid brass, bar sink.
 - 1. General-Duty, Solid-Brass Faucets:
 - a. Just Sinks
 - b. Moen
 - c. Chicago Faucets
 - 2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
4. Finish: Polished chrome plate.
5. Maximum Flow Rate: 1.5 gpm unless otherwise indicated.
6. Mixing Valve: Two-lever handle.
7. Backflow-Prevention Device for Hand Spray: Not required.
8. Centers: 4 inches.
9. Mounting: Deck, exposed.
10. Handle(s): lever.
11. Spout Type: Swivel gooseneck.
12. Spout Outlet: Aerator.
13. Drain: Grid.

2.03 DISPOSERS

- A. Disposers GD-1: Continuous-feed household, food waste.
 1. Continuous-Feed Disposers:
 - a. Insinkerator
 - b. Waste King
 - c. Or approved equal.
 2. Standards: ASSE 1008 and UL 430, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 3. General: Include reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 (DN 40) outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
 4. Model: Sound-insulated chamber.
 5. Motor: 115-V ac, 1725 rpm, 1/2 hp with overload protection.

2.04 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Bar Sink and Kitchen Sink Supply Fittings:
 1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Loose key.
 3. Risers:
 - a. Size: NPS 1/2 (DN 15) for bar sinks and kitchen sinks.
 - b. Material: Chrome-plated, soft-copper flexible tube riser.

2.05 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 (DN 40) straight tailpiece for standard bar sinks and kitchen sinks.
- C. Trap:
 - 1. Size: NPS 1-1/2 (DN 40) for bar sinks and kitchen sinks.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated-brass or -steel wall flange.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install counter-mounting fixtures in and attached to casework.
- C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 22 05 23 "Ball Valves for Plumbing Piping".
- D. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- E. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- F. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- G. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."
- H. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- I. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.04 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 22 42 13.13
COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Water closets.
 - 2. Flushometer valves and tanks.
 - 3. Toilet seats.
 - 4. Supports.

1.03 DEFINITIONS

- A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.
- B. Remote Water Closet: Located more than 30 feet (9.1 m) from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.04 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 water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

1.07 DSA NOTES

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213-3.

- B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.7.2.6.3. No pictogram, text, or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are “ALL-GENDER RESTROOM”, “RESTROOM”, or “UNISEX RESTROOM”. DSA BU 17-01.
- C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
- E. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612.
- F. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for childrens water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
- G. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.
- H. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.5.

PART 2 - PRODUCTS

2.01 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Water Closets WC-1: Floor mounted, bottom outlet, top spud.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Kohler Co.
 - 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard.
 - f. Rim Contour: Elongated.
 - g. Water Consumption: 1.28 gal. (4.8 L) per flush.
 - h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
 - i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASTM A1045 or ASME A112.4.3.
 4. Flushometer Valve: WC-1.
 5. Toilet Seat: WC-1.
- B. Water Closets WC-2: Floor mounted, bottom outlet, top spud.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Kohler Co.
 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
 - f. Rim Contour: Elongated.
 - g. Water Consumption: 1.28 gal. (4.8 L) per flush.
 - h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
 - i. Color: White.
 3. Bowl-to-Drain Connecting Fitting: ASTM A1045 or ASME A112.4.3.
 4. Flushometer Valve: WC-2.
 5. Toilet Seat: WC-2.

2.02 FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves WC-1 and WC-2:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Industries, LLC.
 2. Standard: ASSE 1037.
 3. Minimum Pressure Rating: 125 psig (860 kPa).
 4. Features: Include integral check stop and backflow-prevention device.
 5. Material: Brass body with corrosion-resistant components.
 6. Exposed Flushometer-Valve Finish: Chrome plated.
 7. Panel Finish: Chrome plated or stainless steel.
 8. Style: Exposed.
 9. Consumption: 1.28 gal. (4.8 L) per flush.
 10. Minimum Inlet: NPS 1 (DN 25).
 11. Minimum Outlet: NPS 1-1/4 (DN 32).

2.03 TOILET SEATS

- A. Toilet Seats WC-1 and WC-2:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bemis Manufacturing Company.
 - b. Church Seats; Bemis Manufacturing Company.
 - c. Olsonite Seat Co.
 - 2. Standard: IAPMO/ANSI Z124.5.
 - 3. Material: Plastic.
 - 4. Type: Commercial (Heavy duty).
 - 5. Shape: Elongated rim, open front.
 - 6. Hinge: Self-sustaining, check.
 - 7. Hinge Material: Noncorroding metal.
 - 8. Seat Cover: Not required.
 - 9. Color: White.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Water-Closet Installation:
 - 1. Install level and plumb according to roughing-in drawings.
 - 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 - 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 - 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 - 2. Use carrier supports with waste-fitting assembly and seal.
 - 3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
 - 4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
 4. Install actuators in locations that are easy for people with disabilities to reach.
- D. Install toilet seats on water closets.
- E. Wall Flange and Escutcheon Installation:
1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 3. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- F. Joint Sealing:
1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 2. Match sealant color to water-closet color.
 3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.04 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 22 42 13.16
COMMERCIAL URINALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Urinals.
 - 2. Flushometer valves.
 - 3. Supports.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

1.06 DSA NOTES

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213-3.
- B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.7.2.6.3. No pictogram, text, or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENDER RESTROOM", "RESTROOM", or "UNISEX RESTROOM". DSA BU 17-01.
- C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.

- D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
- E. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612.
- F. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for childrens water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
- G. Accessible lavatories and sinks shall be mounted with the front of the nhigher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.
- H. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.5.

PART 2 - PRODUCTS

2.01 WALL-HUNG URINALS

- A. Urinals UR-1: Wall hung, back outlet, washout.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Kohler Co.
 - 2. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Low.
 - f. Spud Size and Location: NPS 3/4 (DN 20), top.
 - g. Outlet Size and Location: NPS 2 (DN 50), back.
 - h. Color: White.
 - 3. Flushometer Valve: UR-1.
 - 4. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2 (DN 50).
 - 5. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
 - 6. Urinal Mounting Height: Standard.

- B. Urinals UR-2: Wall hung, back outlet, washout, accessible.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Kohler Co.
 2. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Low.
 - f. Spud Size and Location: NPS 3/4 (DN 20), top.
 - g. Outlet Size and Location: NPS 2 (DN 50), back.
 - h. Color: White.
 3. Flushometer Valve: UR-1.
 4. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2 (DN 50).
 5. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
 6. Urinal Mounting Height: Handicapped/elderly according to ICC A117.1.

2.02 URINAL FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves UR-1 and UR-2:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Industries, LLC.
 2. Standard: ASSE 1037.
 3. Minimum Pressure Rating: 125 psig (860 kPa).
 4. Features: Include integral check stop and backflow-prevention device.
 5. Material: Brass body with corrosion-resistant components.
 6. Exposed Flushometer-Valve Finish: Chrome plated.
 7. Panel Finish: Chrome plated or stainless steel.
 8. Style: Exposed.
 9. Consumption: 0.125 gal. per flush.
 10. Minimum Inlet: NPS 3/4 (DN 20).
Minimum Outlet: NPS 3/4 (DN 20).

2.03 SUPPORTS

- A. Type I Urinal Carrier:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. Zurn Industries, LLC.
 - 2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Urinal Installation:
 - 1. Install urinals level and plumb according to roughing-in drawings.
 - 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
 - 3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 - 1. Install supports, affixed to building substrate, for wall-hung urinals.
 - 2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
 - 3. Use carriers without waste fitting for urinals with tubular waste piping.
 - 4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
- C. Flushometer-Valve Installation:
 - 1. Install flushometer-valve water-supply fitting on each supply to each urinal.
 - 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 - 3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
- D. Wall Flange and Escutcheon Installation:
 - 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
 - 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 - 3. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.04 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 22 42 16.13
COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Lavatories.
 - 2. Faucets.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
 - 1. Include the following:
 - a. Servicing and adjustments of automatic faucets.

1.06 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.07 DSA NOTES

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213-3.

- B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.7.2.6.3. No pictogram, text, or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENDER RESTROOM", "RESTROOM", or "UNISEX RESTROOM". DSA BU 17-01.
- C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
- E. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612.
- F. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for childrens water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
- G. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.
- H. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.5.

PART 2 - PRODUCTS

2.01 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory L-1: Ledge back, vitreous china, wall mounted.
 - 1. American Standard
 - 2. Kohler
 - 3. Or approved equal.
 - 4. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Rectangle, 20 inches by 18 inches..
 - d. Faucet-Hole Punching: Three holes, 2-inch (51-mm) centers.
 - e. Faucet-Hole Location: Top.
 - f. Color: White.
 - g. Mounting Material: Chair carrier.
 - 5. Faucet: L-1.
 - 6. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

- B. Lavatory L-2: Same as Lavatory L-1 except mount at Accessible height.

2.02 SOLID-BRASS, MANUALLY OPERATED FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets L-1 and L-2: Manual-type, two-handle metering, commercial, solid-brass valve.
 - 1. Chicago Faucets
 - 2. Or Approved Equal.
 - 3. Standard: ASME A112.18.1/CSA B125.1.
 - 4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 - 5. Body Type: Centerset.
 - 6. Body Material: Commercial, solid brass.
 - 7. Finish: Polished chrome plate.
 - 8. Maximum Flow Rate: 0.4 gpm.
 - 9. Maximum Flow: 0.25 gal. (0.95 L) per metering cycle.
 - 10. Mounting Type: Deck, exposed.
 - 11. Valve Handle(s): Push button.
 - 12. Spout: Rigid type.
 - 13. Spout Outlet: Aerator.
 - 14. Operation: Noncompression, manual.
 - 15. Drain: Grid.

2.03 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
 - 1. NPS 1/2 (DN 15).
 - 2. Chrome-plated, soft-copper flexible tube riser.

2.04 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.

- C. Trap:
 - 1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 22 47 13
DRINKING FOUNTAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes drinking fountains and related components.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountain.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include operating characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For drinking fountains to include in maintenance manuals.

1.05 DSA NOTES

- A. Accessible plumbing fixtures shall comply with all of the requirements of 2019 CBC Division 6.
- B. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612 and DSA Check List Fig. 15-A.
- C. Fixture controls shall comply with 2019 CBC Sections 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-604.9.5 for children's water closets, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
- D. Each accessible sink shall be a maximum of 6-1/2" deep. Sinks shall be mounted with the counter or rim no higher than 34" above the finish floor. 2019 CBC Section 11B-213.3.
- E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

PART 2 - PRODUCTS

2.01 DRINKING FOUNTAINS DF-1: Stainless Steel, wall mounted.

- 1. Stainless-Steel Drinking Fountains:
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Haws Corporation 1119.14 with Model 1920 Bottle Filler.
- 2. Standards:

- a. Comply with 2019 CBC
 - b. Comply with NSF 61.
- 3. Type Receptor: Slab.
- 4. Receptor Shape: Rectangular.
- 5. Back Panel: Stainless-steel wall plate behind drinking fountain.
- 6. Bubblers: Two, with adjustable stream regulator, located on deck.
- 7. Control: Push button.
- 8. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
- 9. Supply: NPS 3/8 (DN 10) with shutoff valve.
- 10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) chrome-plated brass P-trap and waste.
- 11. Support: ASME A112.6.1M, Type I carrier.
- 12. Haws Model 1920 Bottle Filler with mounting plate.

2.02 SUPPORTS

- A. Manufacturers Mounting Frame.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping".
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping".
- D. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.

3.05 CLEANING

- A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

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SECTION 23 00 10
MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The General Conditions and Supplementary Conditions shall apply to and form part of this Division.

1.02 SUMMARY

- A. Work includes, but is not limited to, the following:
 - 1. Labor, material, equipment and transportation to complete the Work as shown on the drawings, specified herein and/or implied thereby.
 - 2. A requirement of the plumbing sections shall be to provide make-up water and drain final connections to systems and equipment.
 - 3. It is the intent of the project that the installation be coordinated to provide a complete and usable facility.
- B. Work not included in this division:
 - 1. Painting, except as hereinafter specified. See Division 9 for painting.
 - 2. Electrical, except for controls hereinafter specified. See Division 26 for electrical.
- C. Related Sections include the following:
 - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."
 - 2. Division 23 Section 23 00 50 "Basic Mechanical Materials and Methods."

1.03 DEFINITIONS

- A. Unless otherwise specified, "all clarification from," "field direction by," "submittals to," "approved by," "processed by," "permission from," and like mentioned herein shall mean from/by/to Architect.
- B. "Provide" means furnish and install referenced item with all appurtenances.
- C. "Shall" indicates a mandatory requirement.
- D. "Air conditioning" is defined as the treatment and/or handling of any air to any degree by the systems shown on the drawings and herein specified and is not restricted to refrigerated cooling.

1.04 DELIVERY AND STORAGE OF MATERIALS

- A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work. Replace all damaged and defective work, material or equipment prior to filing application for final acceptance. Properly protect all openings to equipment, piping, ductwork, accessories, etc. from dirt, dust, and debris prior to and during installation of the work. Ductwork stored at the jobsite shall be covered to protect from dirt, dust, debris, fire proofing, etc.

1.05 CODES AND STANDARDS

- A. Work and materials shall be in full accordance with the latest rules and regulations of the Local Fire Marshal; the National Electric Code (NEC); the Uniform Plumbing Code; the California Plumbing Code; California Administrative Code, Title 24, (CAL/OSHA); Local Building Codes; the Uniform Mechanical Code; the California Mechanical Code; Vol. II of the Uniform Building Code; Volume I and II of the California Building Code; SMACNA "Guidelines for Seismic Restraints of Mechanical Systems"; and other applicable codes, laws or regulations of bodies lawfully empowered and having jurisdiction over this project. Nothing in the plans or specifications shall be construed to permit work not conforming to these codes. When codes conflict with one another, provide larger, higher or more restrictive standards without additional costs.

1.06 PERMITS

- A. Obtain all permits, patent rights, and licenses that are required for the performing of this work by all laws, ordinances, rules and regulations, or orders of any officer and/or body. Provide all notices necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on account thereof. No work shall be covered before inspection by the jurisdictional authorities and observation by the Architect or the owner's designated representatives.

1.07 EXPLANATION AND PRECEDENCE OF DRAWINGS

- A. Drawings and specifications are intended to be read together so that any work mentioned in one and not the other shall be executed the same as if mentioned in both.
- B. For purposes of clearness and legibility, drawings are essentially diagrammatic. The size and location of equipment is drawn to scale wherever possible. Contractor shall make use of data in the contract documents and shall verify this information at the building site.
- C. Where the contract specifications and/or drawings are in conflict, obtain clarification of such during bidding. Where addenda for clarification of such is not timely, base the bid on the higher standards or more restrictive requirements; prior to fabrication, obtain written clarification.
- D. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. It is not intended that drawings indicate necessary offsets. The Contractor shall make the installation in such a manner as to conform to the structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or costs to the Owner.
- E. It is intended that apparatus be located symmetrical with architectural elements. Refer to architectural details in completing the correlating work.
- F. The Contractor shall study drawings and specifications including, and not limited to, architectural, structural, mechanical, plumbing, fire protection, and electrical to determine conflict with ordinances and statutes. Errors or omissions shall be reported in writing, and changes shall be included in the as-built drawings and the additional work performed at no cost to the Owner.
- G. Submittal of bid shall indicate the Contractor has examined the site and drawings and has included required allowances in his bid. No allowance shall be made for any error resulting

from Contractor's failure to visit job site and to review drawings and specifications. Bid shall include costs for required drawings and changes as outline above, all at no cost to owner.

1.08 RECORD DRAWINGS

- A. In addition for requirements for shop drawings specified elsewhere, provide and maintain on the job one complete set of blue line prints of the record drawings for all the mechanical and plumbing work. Carefully record on this set of prints, work including piping, valves, etc., which is installed differently from that indicated in the specifications and on the drawings; locate dimensionally from fixed points. The depth shall be indicated for all plugged wyes, tees and capped lines.
- B. These record drawings shall be continuously kept up-to-date, and shall be available for inspection at all times. Existing lines discovered shall be indicated on these drawings.
- C. At completion of work, provide a neat and legible reproducible set of these up-to-date record drawings which shall be individually signed and dated by the Contractor and the job inspector as to their accuracy.
- D. Record drawings shall be submitted for acceptance and approval to the Architect and Mechanical Engineer before final certificate of acceptance will be issued.
- E. Record drawings shall show the exact location of all control sensor devices.

1.09 CUTTING AND PATCHING

- A. Perform all cutting and fitting required for work of this section in rough construction of the building. Obtain permission of the Structural Engineer prior to cutting any structural building elements.
- B. All patching of finished construction of building shall be performed under the sections of specifications covering these materials by the trades at no additional cost to the Owner.
- C. All cutting of concrete work by Contractor shall be by core drilling or concrete saw. No cutting or coring shall be done without first obtaining the permission of the Architect and Owner.
- D. All patching of existing surfaces shall match existing material and finish.

1.10 DAMAGE BY LEAKS

- A. Contractor shall be responsible for damage to the grounds, walks, roads, buildings, finishes, surfaces, materials, equipment, piping systems, electrical systems and their equipment and contents, caused by leaks in the piping systems being installed or having been installed herein. He shall repair at his expense all damage so caused. All repair work shall be done as directed by the Architect and Owner.

1.11 EMERGENCY REPAIRS

- A. The Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibilities.

1.12 LOCATIONS

- A. Coordinate in advance of the work, requirements for openings, equipment maintenance clearances, recesses and chases in the walls, partitions, equipment housekeeping pads, framing or openings. Should furnishing this information be neglected, delayed or incorrect

and additional cutting is found to be required, the cost of same shall be borne by the Contractor. Nothing in this paragraph shall be construed to relieve the Contractor of the responsibility for providing and paying for the required core drilling and openings in existing work.

B. Diagrammatic Indications on Drawings are:

1. Approximate only.
2. At various locations shown distorted for clarity.

C. Exact Locations Shall:

1. Be as required for proper installation in available space.
2. Avoid interference with architectural, electrical and structural features.
3. Be coordinated with the work of other trades toward the general purpose of having the work progress rapidly and smoothly with a minimum interference between one trade and another.
4. Preserve headroom and keep openings and passageways clear.
5. Have a neat arrangement symmetrical to the building lines, light and tile pattern.
6. Be reasonably accessible for hung ceiling areas for maintenance from the floor below. Equipment, valves, and other items requiring maintenance, adjustment and/or observation shall be accessible.

1.13 SUPPORTS, EQUIPMENT PADS, STAGING, ETC.

- A. Construction supports required for the proper installation of equipment shall be in accordance with the drawings, manufacturer's requirements, seismic requirements, and applicable codes. Check architectural and structural drawings for equipment pads by others. Provide staging, scaffolds, platforms, ladders or similar facilities required to properly install the work.

1.14 INTERRUPTION OF UTILITIES

- A. The Contractor shall schedule and coordinate all interruptions of utilities with the Architect and Owner within 30 days after award of contract. The Contractor shall submit to the Owner a schedule of proposed interruptions. At least 72 hours prior to the interruption, the contractor shall submit a request indicating the proposed date and duration of interruption, the work to be accomplished, the areas which will be affected and a proposed contingency plan to be followed in the event that normal service or facilities cannot be restored on schedule. Do not commence work until the time, date, and contingency have been approved in writing by the Architect and Owner.
- B. Provide any labor and materials necessary to restore services on a contingency basis should normal service or facilities not be restored on schedule.
- C. Preparatory work associated with each interruption shall be performed during normal work hours. The actual interruption required for tie-in shall be performed between 8 P.M. and 5 A.M. Maximum shutdown during this period of any system shall be 4 hours.

1.15 SUBSTITUTIONS

- A. If substitutions of controls or equipment requires any changes in the architectural, structural, mechanical, plumbing or electrical work from that shown on the drawings(including all environmental characteristics), the extra cost of the equipment or architectural, structural,

mechanical, plumbing or electrical work shall be responsibility of the Contractor requesting the substitution. All substitutions shall be approved by the Architect before purchase by the contractor.

- B. If the Contractor proposes substitutions of any equipment specified herein or on the drawings, it shall be the Contractor's responsibility to obtain approval from the Architect for such equipment as well as approval for anchorage of such equipment from the Architect, Structural Engineer, and governing approval agencies (Department of the State Architects - DSA),. All costs required for such approval shall be the responsibility of the Contractor requesting the substitution.

1.16 PREPARATION OF SUBMITTALS

- A. Refer to Division 1. In addition to the requirements of Division 1, provide the requirements specified herein.
- B. Prior to commencement of work and in accordance with the General Requirements, submit for review six copies of proposed equipment and material submittals. The Contractor shall verify the delivery dates are compatible with the specified construction schedule; and verify the equipment is sized to accommodate the conditions specified. Submittals shall include manufacturer's names and model numbers and shall comply with specifications and drawings. The Contractor shall bear the cost of changes necessary to accommodate substitutions if substitution is approved.
- C. Provide formal submittal to Architect. Review of the formal submittal is only for general conformance with design concept of project and general compliance with the information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination of work of all trades. Deviations from Drawings and Specifications shall be clearly and completely indicated (by a separate letter) in the formal submittals. Reviewed Submittals shall not relieve the Contractor of responsibility for errors or deviations.
 - 1. Where specific model numbers and/or manufacturers are specified or shown, it is the intent of the contract documents to procure the specified item(s). Alternate equipment may not be used unless data is submitted for consideration as a substitution in accordance with General Requirements and this section.
 - 2. Model numbers used may not indicate all features or options required for this specific installation. Modify the specified models to comply with the requirements, as specified or shown.
 - 3. Product Data for Proposed Substitutions:
 - a. Submit copies of complete data, with drawings and samples as appropriate, including:
 - 1) Comparison of the qualities of the proposed substitution with that specified.
 - 2) Changes required in other elements of the work because of the substitution.
 - 3) Affect on construction schedule.
 - 4) Cost data comparing the proposed substitution with the product specified.

- 5) Availability of maintenance service and source of replacement materials.
 - 6) Reference to three (3) projects similar to this where such equipment is installed and operating to two (2) or more years.
- b. Acceptance of substitutions is entirely at the discretion of the Architect.
- D. Formal submittals shall be complete with catalog data and information properly marked to indicate equality of material (where substitution is allowed and desired), adequacy in capacity and performance to meet minimum capacities or performance as specified or indicated. Arrange the submittals in the same sequence as these Specifications and indicate the Section and Paragraph number (in the upper right-hand side with tabs) for which each submittal is intended. Incomplete submittals shall be rejected.
- E. Do not fabricate order or deliver materials or equipment until formal submittals have been approved. Where material or equipment is used without such permission, it is deemed that the material or equipment shall be in complete compliance with drawings and specifications, without additional cost where such compliance is lacking and may be required to be altered in the field.
- F. Submittals shall be bound and shall include, at a minimum, the following:
 - 1. Complete bill of materials listing equipment furnished.
 - 2. Catalog cut sheets of every component being provided (highlighted).
 - 3. Provide completed blue-line shop drawings of the packaged equipment detailing all field connection points.
 - 4. Dimensions, clearance requirements, weights, and capacities.
 - 5. Wiring diagrams showing control interface as applicable.
 - 6. Warranty sheets.
 - 7. Pressure drops as applicable.
- G. Contractor shall incur all costs for time spent by Engineer for review of more than two submittals on each item. Costs shall be based on Engineer's hourly billing rate schedule at the time of review. Rate schedule available upon request. Engineer shall invoice the contractor upon completion of review and shall be paid by the contractor within 30 days of date of invoice. Failure to remit will withdraw approval (if any) of submittals in question.

1.17 SHOP DRAWINGS:

- A. Proceed with preparation of shop drawings immediately upon receiving an authorization to proceed for the project. Shop drawings shall be originally prepared by the contractor. Provide minimum 1/4" scale shop drawings in electronic format. Submit a complete set in one package prior to material fabrication, order and installation.
- B. Include:
 - 1. Duct and pipe elevations and sizes.
 - 2. Double line ductwork and piping (4" and larger).
 - 3. Actual size of purchased equipment from certified shop drawings.
 - 4. Access panels including ceiling panels.
 - 5. Access clearances for equipment.
 - 6. Actual locations of ceiling diffusers/ supply registers and return registers.

7. Actual locations of manual volume dampers.
 8. Locations of structural penetrations such as beams.
 9. Actual location of control panels and power connections to equipment.
 10. Color coded duct and piping based on material used.
 11. Label and tag schedule for equipment.
 12. Duct transitions to clear beams or tight areas.
 13. Room temperature sensor locations.
 14. Point of connection to utilities outside the building.
 15. Sections or 3-dimensional drawings of congested areas.
 16. Gridlines.
 17. Duct and piping supports on roof.
- C. Coordinate with other trades in preparation of shop drawings.
 - D. Submit a copy of coordinated shop drawings to General Contractor for distribution to other trades, including electrical and fire sprinkler contractor.
 - E. Submit to commissioning agent for approval to assure design intent is met.
 - F. Prior to fabrication and upon receiving approval from commissioning agent, submit a complete set of shop drawings at one time to the mechanical engineer.

1.18 ELECTRICAL REQUIREMENTS

- A. Coordinate the following items with Division 26:
 1. Power wiring
 2. Power Supply Voltage Requirements
 3. Safety switches
 4. Combination controllers
 5. Disconnect switches
 6. Motor starters
 7. Circuit breakers
 8. Motor-control equipment forming part of motor control centers or switchgear assemblies
 9. Electrical connections of the mechanical equipment to the electrical power source shall be coordinated with and provided under Division 26.

1.19 MOTORS

- A. Before order is placed for electrical devices, the Contractor shall check with the Electrical contractor and verify requirements as to type, mounting and current characteristics as well as to any special delivery instructions. Motors provided under Division 23 shall be minimum of 10% normal rating above brake horsepower (BHP) rating of equipment driven.

1.20 TESTS

- A. Contractor shall make tests required by legally constituted authorities and as listed below.

1. Tests shall be made in the presence of the Owner or his representative and a duly authorized inspector. The Owner or his representative shall be notified 5 days before tests are made.
2. Concealed work and insulated work shall remain uncovered until required testing has been performed and approved by the Owner. If work to be tested is covered before the approval of the Owner or his authorized representative has been obtained, it shall be uncovered for testing at the Contractor's expense.
3. Obtain required documents of certification indicating approval, acceptance and compliance with the requirements of all administrative authorities having jurisdiction over the work. No final payment shall be made until all such certificates are delivered to the Owner.
4. Furnish labor, materials, instruments and bear other costs in connection with all tests.
5. Piping systems, except as hereinafter noted, shall be given hydrostatic (with water) test of a least 150% of the maximum operating pressure but no less than 150 psig.
6. Before making test, remove or valve off from the system, gauges, traps, and other apparatus or equipment which may be damaged by test pressure.
7. Install a calibrated test pressure gauge in the system to observe any loss in pressure. Maintain the required test pressure for a sufficient length of time to enable an inspection to be made of all joints and connections. Perform tests after installation and prior to acceptance.
8. Final pressures at the end of the test period shall be no more or less than that caused by expansion or contraction of the test medium due to temperature changes.
9. After tests have been made and leaks repaired, clean and flush systems as hereinafter specified. Water piping shall be left under supply main pressure for the balance of the construction period.
10. Tests for mechanical, plumbing, and fire protection systems are specified within their own section. Equipment and ductwork system tests are specified in the test and balance section.
11. Provide necessary provisions and tests for maintaining the operational condition and cleanliness of existing systems.

1.21 LABOR AND MATERIALS

- A. Labor shall be carefully skilled for this kind of work, and under the direction of a competent foreman.
- B. Materials shall be new, in perfect condition and of domestic manufacturer. Materials for similar uses to be of same type and manufacturer.
- C. Equipment shall bear the manufacturer's label showing performance characteristics. Identifying size number shall be given only when it is not practicable or customary to show performance characteristics.
- D. Valves, pipe, fittings, etc., shall bear the manufacturer's name or trademark.
- E. Unless otherwise specified herein, equipment and fixtures shall be installed in accordance with the manufacturer's recommendations, including recommended service and removal clearances.

1.22 PROTECTION AND CLEAN-UP

- A. Protection: Provide for the safety and good condition of materials and equipment until final acceptance of the Architect. Protect materials and equipment from dirt, dust, debris, and damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work and replace all damaged and defective material, equipment or work precedent to filing application for final acceptance.
- B. Cleaning:
 - 1. Unless a more stringent requirement is specified, thoroughly clean all parts of the piping, ductwork, fixtures, apparatus and equipment. All parts shall be thoroughly cleaned of dirt, dust, debris, cement, plaster and other materials, and all grease and oil spots removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Clean all systems, including piping and ductwork prior to test.
 - 2. Exposed rough metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left in clean condition to receive painter's finish. Where factory prime coat has been damaged, this Contractor shall be responsible for restoration of same.

1.23 ACCESS PANELS

- A. Access Doors and Panels:
 - 1. Wherever volume dampers, fire dampers, smoke fire dampers, controls, valves or other items or parts of the installation which require periodic inspection or adjustments are concealed by permanent non-removable construction, an access door shall be provided. Rating of access panel shall be determined by rating of wall or ceiling in which panel is installed. Types to be as approved and as appropriate for the surface and construction in which it is installed. Verify all locations with Architect and other trades.
 - 2. Access doors and panels shall be of sufficient size and shall be located properly to assure service to the intended item.

1.24 MAINTENANCE, OPERATION INSTRUCTION

- A. General: Thoroughly instruct the Owner's operators in every detail of operation of the system. Provide the Owner with a list of all equipment, giving the manufacturer's name, model number, serial number, parts list and complete internal wiring diagrams. All directions for operation furnished by the manufacturer shall be carefully saved and turned over to the Owner, together with written sequence of operation, operating and maintenance instructions for each system and its equipment. Instruction shall consist of a minimum of four 8-hour periods over consecutive days and shall be 30% classroom and 70% at site location. Coordinate scheduling of instruction times with Owner's operators.
- B. Specific Data: Submit four complete sets of the following data to the Owner for approval and commissioning agent for review prior to acceptance of the installation, complete and at one time; (partial or separate data will not be accepted) data shall consist of the following:
 - 1. Valve Directory: Indicating valve number, location, function and normal operating position for each.
 - 2. Color code schedule.
 - 3. Equipment: List of name plates, including name plate data.

4. Manufacturer's Literature: Copies of manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts lists and drawings. Mark or highlight brochure literature indicating the models, sizes, capacities, curve operating points, etc., in a manner to clearly indicate the equipment installed. Remove all pages or sheets from the bulletin and catalogs that do not pertain to equipment installed on the project.
5. Written Instructions: Typewritten instructions for operation and maintenance of the system composed of OPERATING INSTRUCTIONS, MAINTENANCE INSTRUCTIONS and a MAINTENANCE SCHEDULE.
 - a. OPERATING INSTRUCTIONS shall contain a brief description of the system. Adjustments requiring the technical knowledge of the service agency personnel shall not be included in the operating instructions. The fact such adjustments are required, however, shall be noted.
 - b. MAINTENANCE INSTRUCTIONS shall list each item of equipment requiring inspection, lubrication or service and describe the performance of such maintenance.
 - c. MAINTENANCE SCHEDULE shall list each item of equipment requiring maintenance, shall show the exact type of maintenance on every component of each item of equipment, and shall show when each item of equipment should be inspected or services.
6. Instructions: Operating personnel shall be instructed in the operation of the system in accordance with typewritten, approved instructions.
- C. Binders: Provide complete sets of the above data in loose-leaf ring-type binders with permanent covers, with identification on front and on spine.

1.25 SPECIAL REQUIREMENTS

- A. During the guarantee period and as directed by the Owner, make any additional tests, adjustment, etc., that may be required and correct any defects or deficiencies arising from operation of the systems. Operational tests shall be made during both heating and cooling seasons and on all systems.
- B. Completion:
 1. The entire mechanical system shall be commissioned in accordance with ASHRAE Guideline 1-1996 and the requirements of this specification. A final commissioning report shall be approved by the Owner, Architect, and Mechanical Engineer prior to final acceptance of the work.
 2. When the installation is complete and adjustments specified herein have been made, the system, shall be operated for a period of one week, during which time it shall be demonstrated to the Owner or his representative as being completed and operating in conformance with these specifications. The Contractor shall schedule all work so that this time period, which is to confirm a "bug-free" system, will occur before the total project is accepted for substantial completion by Owner.
 3. The work hereunder shall not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, valve directories, piping identification code directory, and nameplates specified herein have been approved and properly posted in the building.

1.26 WARRANTY/GUARANTEE

- A. The contractor shall warranty/guarantee that materials, apparatus, and equipment furnished and installed under the mechanical division of these specifications shall be new and free from all defects. Should any defects develop, within one year (unless a longer period is listed in other sections of the specifications) from the date of final acceptance by the owner or from the date of certificate of substantial completion, whichever is earlier, due to inferior or faulty materials and/or workmanship, the trouble shall be corrected by this Contractor without expense to the Owner. Any defective materials or inferior workmanship noticed at the time of installation or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.
- B. The work shall be installed of such materials and in such a manner that:
 - 1. The operation of all parts of the system shall be noiseless to the extent that no objectionable sound of operation will be heard outside of the rooms enclosing the apparatus or equipment.
 - 2. Apparatus or equipment shall operate in accordance with detailed specifications covering each item.
 - 3. Contractor shall, at his own expense, make any adjustments or changes required to produce a condition of quietness satisfactory to the Engineer or his representative. Such adjustments or changes shall not reduce the performance or quantities called for on the drawings.
 - 4. Contractor shall guarantee that his installation of all materials and equipment will meet the performance requirements of these specifications and that all equipment will deliver the specified or required capacities.
 - 5. The Owner reserves the right to make temporary or emergency repairs as necessary to keep equipment in operating condition without voiding the guarantee contained herein nor relieving the Contractor of his responsibilities during the guarantee period.
 - 6. Contractor shall be responsible for all damage to any part of the premises caused by leaks or break in pipe lines, fixtures or equipment furnished and installed under his contract for a period of one year after date of acceptance of the project by Owner. He shall replace in kind, at his own expense, any and all items so damaged to the complete satisfaction of the Owner.

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SECTION 23 00 50
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Flexible connectors.
 - 6. Mechanical sleeve seals.
 - 7. Equipment nameplate data requirements.
 - 8. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Identification for HVAC Piping and Equipment."
 - 9. Nonshrink grout for equipment installations.
 - 10. Field-fabricated metal and wood equipment supports.
 - 11. Installation requirements common to equipment specification sections.
 - 12. Cutting and patching.
 - 13. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 23 piping system Sections.
- C. Related Sections include the following:
 - 1. Division 1 Section "LEED Requirements".

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
 - 1. CR: Chlorosulfonated polyethylene synthetic rubber.
 - 2. EPDM: Ethylene propylene diene terpolymer rubber.

1.04 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- D. Coordination Drawings: For access panel and door locations.
- E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 4. Equipment and accessory service connections and support details.
 - 5. Exterior wall and foundation penetrations.
 - 6. Fire-rated wall and floor penetrations.
 - 7. Sizes and location of required concrete pads and bases.
 - 8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 - 9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.05 QUALITY ASSURANCE

- A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors,

bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dielectric Unions:
 - a. Epco Sales Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Zurn Industries, Inc.; Wilkins Div.
 - 2. Dielectric Flanges:

- a. Epco Sales Inc.
 - b. Watts Industries, Inc.; Water Products Div.
- 3. Dielectric-Flange Insulating Kits:
 - a. Calpico, Inc.
 - b. Central Plastics Co.
- 4. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- 5. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.
 - b. Victaulic Co. of America.
- 6. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.02 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
 - 1. Alloy E: Approximately 95 percent tin and 5 percent antimony, lead free.
- F. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.

- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- I. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.

2.04 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.05 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.06 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with setscrews.
5. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 2. OD: Completely cover opening.
 3. Cast Brass: Split casting, with concealed hinge and set screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome-plate.
 4. Stamped Steel: One piece, with spring clips and chrome-plated finish.
 5. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
 6. Cast-Iron Floor Plate: One-piece casting.

2.07 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psig, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
 - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Sections for flashing.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Sections for materials.
 - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Sections for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
- W. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.03 PAINTING AND FINISHING

- A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.

4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- C. Paint visible sheet metal behind ceiling inlets and outlets flat black.
 - D. Do not paint piping specialties with factory-applied finish.
 - E. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.05 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.06 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.07 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.08 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.

- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION

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SECTION 23 01 30.51
HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of HVAC duct system, equipment, and related components.
- B. Testing and inspection agency employed by District.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Additional requirements for testing and inspection agencies.
- B. Section 01 57 19 - Temporary Environmental Controls.
- C. Section 23 08 00 - Commissioning of HVAC.

1.03 DEFINITIONS

- A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.
 - 1. Above-ceiling plenum for supply air is required to be cleaned.
 - 2. Above-ceiling plenum for return air is required to be cleaned.
 - 3. Makeup air system is required to be cleaned.
 - 4. Exhaust-only system is required to be cleaned.

1.04 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. NADCA ACR - Assessment, Cleaning and Restoration of HVAC Systems.
- C. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.
- D. UL 181A - Closure Systems for Use with Rigid Air Ducts.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
- C. Qualifications Statement: Submit qualifications of proposed cleaning contractor for approval.
- D. Project Cleanliness Evaluation and Cleaning Plan, as specified.
- E. Material Safety Data Sheets (MSDS): For all chemical products proposed to be used in the cleaning process; submit directly to District.
- F. Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

1.06 QUALITY ASSURANCE

- A. Information Available to Contractor: No existing system documentation is available.
- B. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
 - 1. Certified by one of the following:
 - a. NADCA, National Air Duct Cleaners Association: www.nadca.com
 - b. Nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
 - 2. Having minimum of three years documented experience.
 - 3. Employing for this project a supervisor certified by same organization that certified the cleaning contractor.
- C. Testing and Inspection Agency Qualifications: Experienced in inspection and testing using methods defined in NADCA ACR.
 - 1. See Section 01 40 00 for additional requirements.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.
- B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.
- C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

2.02 REPLACEMENT PRODUCTS

- A. Fibrous Glass Insulation: Provide material complying with UL 181 equivalent to existing material in quality and thickness.

2.03 SURFACE TREATMENTS

- A. Anti-Microbial Materials: EPA registered specifically for use on non-porous HVAC system surfaces and applied per manufacturer's instructions.
- B. Surface Coating for Fibrous Glass Materials: Water-based, zero VOC; flame spread index less than 25, smoke developed index less than 450, Class A, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. Comply with applicable federal, state, and local requirements.
- B. Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.
- C. Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.
- D. Take precautions to prevent introduction of additional hazards into occupied spaces.
- E. Comply with requirements of Section 01 57 19.
- F. Obtain District's approval of proposed temporary locations for large equipment.
- G. Designate a decontamination area and obtain District's approval.
- H. When portions of the facility are to remain occupied or in operation during cleaning activities, provide adequate controls or containment to prevent access to spaces being cleaned by unauthorized persons and provide detailed instructions to District as to these controls or containment.
- I. If unforeseen mold or other biological contamination is encountered, notify Architect immediately, identifying areas affected and extent and type of contamination.

3.02 EXAMINATION

- A. Prior to the commencement of any cleaning work, prepare and submit to Architect a project evaluation and plan for this project, including considerations recommended in NADCA ACR.
- B. Coordinate cleaning plan with indoor air quality control plan specified in Section 01 57 19.
- C. Inspect the system as required to determine appropriate methods, tools, equipment, and protection.
- D. Start of cleaning work constitutes acceptance of existing conditions.
- E. When concealed spaces are later made accessible, examine and document interior conditions prior to beginning cleaning.
- F. Document all instances of mold growth, rodent droppings, other biological hazards, and damaged system components.

3.03 PREPARATION

- A. When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
- B. Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.
- C. Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning.

- D. Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.
 - 1. Do not cut openings in non-HVAC components without obtaining the prior approval of District.
 - 2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
 - 3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.
- E. Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

3.04 CLEANING

- A. Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.
- B. Obtain District's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.
- C. Ducts: Mechanically clean all portions of ducts.
- D. Hoses, Cables, and Extension Rods: Clean using suitable sanitary damp wipes at the time they are being removed or withdrawn from their normal position.
- E. Registers, Diffusers, and Grilles: When removing, take care to prevent containment exposure due to accumulated debris.
- F. Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove refrigeration coils from system to clean; report coils that are permanently impacted.
- G. Fibrous Glass Material: Use HEPA vacuuming equipment, under constant negative pressure, do not permit to get wet, and do not damage surfaces; replace material damaged by cleaning operations.
- H. Existing Damaged Fibrous Glass Material: Report to Architect all evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture that cannot be remedied by cleaning or resurfacing with an acceptable insulation repair coating.
 - 1. Material with active fungal growth is considered unremediable.
 - 2. Remove unremediable material and clean underlying surfaces.
 - 3. Where surface damage can be repaired by applying a coating, do so at no extra cost to District.
 - 4. Replace unremediable material.
- I. Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- J. Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

3.05 REPAIR

- A. Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.
- B. At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.
- C. Reseal new openings in accordance with NADCA Standard 05.
- D. Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.
- E. When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to District in project report documents.

3.06 FIELD QUALITY CONTROL

- A. Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.
- B. Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.
- C. Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.
- D. Notify Architect when cleaned components are ready for inspection.
- E. Notify District's testing and inspection agency when cleaned components are ready for inspection.
- F. District reserves the right to verify cleanliness using NADCA ACR Surface Comparison Testing or NADCA Vacuum Test.
- G. When directed, re-clean components until they pass.
- H. Contractor shall bear the costs of retesting due to inadequate cleaning.
- I. Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

3.07 ANTI-MICROBIAL TREATMENT

- A. When directed, apply anti-microbial treatment to internal surfaces.
- B. Apply anti-microbial agent after removal of surface deposits and debris.
- C. Apply anti-microbial treatments and coatings in strict accordance with the manufacturer's written recommendations and EPA registration listing.
- D. Spray coatings directly onto interior ductwork surfaces; do not "fog" into air stream.

3.08 ADJUSTING

- A. After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

3.09 WASTE MANAGEMENT

- A. Double-bag waste and debris in 6 mil, 0.006 inch thick polyethylene plastic bags.
- B. Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Pipe stands.
 - 7. Pipe positioning systems.
 - 8. Equipment supports.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Division 21 Section "Wet-Pipe Sprinkler Systems" for pipe hangers for fire-protection piping.
 - 3. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
 - 4. Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
 - 5. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.02 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.04 SUBMITTALS

- A. Product Data: For the following:
 1. Steel pipe hangers and supports.
 2. Thermal-hanger shield inserts.
 3. Powder-actuated fastener systems.
 4. Pipe positioning systems.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 1. Trapeze pipe hangers. Include Product Data for components.
 2. Metal framing systems. Include Product Data for components.
 3. Pipe stands. Include Product Data for components.
 4. Equipment supports.
- D. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.
- E. Welding Certificates.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.
 - 3. Grinnell Corp.
 - 4. National Pipe Hanger Corporation.
 - 5. PHD Manufacturing, Inc.
 - 6. PHS Industries, Inc.
 - 7. Piping Technology and Products, Inc.
 - 8. Tolco, Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. Power-Strut Div.; Tyco International, Ltd.
 - 4. Unistrut Corp.; Tyco International, Ltd.
 - 5. Thomas & Betts Corporation
 - 6. Tolco, Inc.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 - 1. ERICO/Michigan Hanger Co.
 - 2. Pipe Shields, Inc.

3. Rilco Manufacturing Company, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Hilti, Inc.
 - c. ITW Ramset/Red Head.

2.07 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
 1. Manufacturers:
 - a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
 1. Manufacturers:
 - a. MIRO Industries.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 1. Manufacturers:

- a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
 - c. Portable Pipe Hangers.
- 2. Base: Plastic.
- 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
- 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 1. Manufacturers:
 - a. Portable Pipe Hangers.
 - 2. Bases: One or more plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.08 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
 - 1. C & S Mfg. Corp.
 - 2. HOLDRITE Corp.; Hubbard Enterprises.
 - 3. Samco Stamping, Inc.

2.09 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
 - 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
 - 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.02 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Sections for roof accessories and curbs.
- G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Sections for plumbing fixtures.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

- a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- 5. Pipes NPS 8 and Larger: Include wood inserts.
- 6. Insert Material: Length at least as long as protective shield.
- 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.04 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.06 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
 - 1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 - 2. Adjusting total HVAC systems to provide indicated quantities.
 - 3. Measuring electrical performance of HVAC equipment.
 - 4. Setting quantitative performance of HVAC equipment.
 - 5. Verifying that automatic control devices are functioning properly.
 - 6. Measuring sound and vibration.
 - 7. Reporting results of the activities and procedures specified in this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."
 - 2. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
 - 3. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

- G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- K. Test: A procedure to determine quantitative performance of a system or equipment.
- L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- M. AABC: Associated Air Balance Council.
- N. AMCA: Air Movement and Control Association.
- O. CTI: Cooling Tower Institute.
- P. NEBB: National Environmental Balancing Bureau.
- Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.
- D. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.
- E. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- F. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.
- G. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.05 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

- B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items: Include at least the following:
 - a. Submittal distribution requirements.
 - b. Contract Documents examination report.
 - c. Testing, adjusting, and balancing plan.
 - d. Work schedule and Project site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
- C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - 2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
- D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
- E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
- G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

- A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

- C. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.08 WARRANTY

- A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. National Project Performance (or special) Guarantee: Provide a guarantee on AABC'S "National Standards" (or NEBB) forms stating that AABC (or NEBB) will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
 - 2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine project record documents described in Division 01 Section for Project Record Documents.
- D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and

charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

- F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- G. Examine system and equipment test reports.
- H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- K. Examine fan coil units to verify that they are accessible and their controls are connected and functioning.
- L. Examine plenums, utilized for outside air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine equipment for installation and for properly operating safety interlocks and controls.
- O. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices operate by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions.
 - 4. Automatic modulating and shutoff valves are properly connected.
 - 5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 6. Sensors are located to sense only the intended conditions.
 - 7. Sequence of operation for control modes is according to the Contract Documents.
 - 8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
 - 9. Interlocked systems are operating.
 - 10. Changeover from heating to cooling mode occurs according to design values.
- P. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, smoke, and fire dampers are open.
 - 5. Isolating and balancing valves are open and control valves are operational.
 - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 7. Windows and doors can be closed so design conditions for system operations can be met.

3.03 GENERAL TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards (or NEBB's Procedural Standards for Testing Adjusting, and Balancing of Environmental Systems") and this Section.
- B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.

- J. Check for proper sealing of air-handling unit components.

3.05 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

- A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems. Additional procedures are required for variable-air-volume, and process exhaust-air systems. These additional procedures are specified in other articles in this Section.
- B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each air-handling unit component.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
- C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
 - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.
- D. Measure terminal outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.
- E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.
 1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.06 MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer, model, and serial numbers.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating if high-efficiency motor.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.07 TEMPERATURE TESTING

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.08 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Verify free travel and proper operation of control devices such as damper and valve operators.

- F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.
- G. Confirm interaction of electrically operated switch transducers.
- H. Confirm interaction of interlock and lockout systems.
- I. Verify main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.09 TOLERANCES

- A. Set HVAC system airflow rates within the following tolerances:
 - 1. Supply, Return and Exhaust Fans: Plus 10 percent to minus 5 percent.
 - 2. Air Outlets and Inlets: Plus 10 percent to minus 5 percent.

3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the certified field report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:
 - a. Design versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings, including settings and percentage of maximum pitch diameter.
 - f. Variable speed drive settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:
 1. Quantities of outside, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Balancing stations.
- F. Air-Handling Unit Test Reports: For air-handling and fan coil units with coils, include the following:
 1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.

- f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Sheave dimensions, center-to-center and amount of adjustments in inches.
 - j. Number of belts, make, and size.
 - k. Number of filters, type, and size.
 - 2. Motor Data: Include the following:
 - a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Sheave dimensions, center-to-center and amount of adjustments in inches.
 - 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Cooling coil static-pressure differential in inches wg.
 - g. Heating coil static-pressure differential in inches wg.
 - h. Outside airflow in cfm.
 - i. Return airflow in cfm.
 - j. Outside-air damper position.
 - k. Return-air damper position.
- G. Fan Test Reports: For supply and exhaust fans, include the following:
- 1. Fan Data: Include the following:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Sheave dimensions, center-to-center and amount of adjustments in inches.
 - 2. Motor Data: Include the following:
 - a. Make and frame type and size.

- b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Sheave dimensions, center-to-center and amount of adjustments in inches.
 - g. Number of belts, make, and size.
- 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data: Include the following:
 - a. System and air-handling unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Design airflow rate in cfm.
 - h. Design velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- I. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:
 - 1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.
 - c. Unit make and model number.
 - d. Manufacturer's compressor serial numbers.
 - e. Compressor make.
 - f. Compressor model and serial numbers.
 - g. Refrigerant weight in lb.
 - h. Low ambient temperature cutoff in deg F.

2. Test Data: Include design and actual values for the following:
 - a. Entering-air, dry-bulb temperature in deg F.
 - b. Leaving-air, dry-bulb temperature in deg F.
 - c. Control settings.
 - d. Unloader set points.
 - e. Low-pressure-cutout set point in psig.
 - f. High-pressure-cutout set point in psig.
 - g. Suction pressure in psig.
 - h. Suction temperature in deg F.
 - i. Condenser refrigerant pressure in psig.
 - j. Condenser refrigerant temperature in deg F.
 - k. Oil pressure in psig.
 - l. Oil temperature in deg F.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. The kW input.
 - p. Crankcase heater kW.
 - q. Number of fans.
 - r. Condenser fan rpm.
 - s. Condenser fan airflow rate in cfm.
 - t. Condenser fan motor make, frame size, rpm, and horsepower.
 - u. Condenser fan motor voltage at each connection.
 - v. Condenser fan motor amperage for each phase.
- J. Instrument Calibration Reports: For instrument calibration, include the following:
 1. Report Data: Include the following:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.12 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes semirigid and flexible duct, and plenum, insulation; insulating cements; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
 - 1. Division 01 Sustainable Design Requirements – LEED Sections.
 - 2. Division 07 Sections for firestopping materials and requirements for penetrations through fire and smoke barriers.
 - 3. Division 23 Insulation Sections for insulation for piping systems.
 - 4. Division 23 Section "Metal Ducts" for duct liner.

1.03 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Removable insulation sections at access panels.
 - 2. Application of field-applied jackets.
 - 3. Applications at linkages for control devices.
- D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

- A. Coordinate clearance requirements with duct Installer for insulation application.

1.07 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.03 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8-oz./sq. yd.
 1. Tape Width: 4 inches.
- B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
 1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
 2. Galvanized Steel: 0.005 inch thick.
 3. Nickel-Copper Alloy: 0.005 inch thick.
- C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
- D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts and plenums; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

2.04 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.
- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

- L. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
 - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
 - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
 - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
- O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
 - 1. Seal penetrations with vapor-retarder mastic.
 - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 - 3. Seal insulation to roof flashing with vapor-retarder mastic.
- P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

3.04 MINERAL-FIBER INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - 4. Impale insulation over anchors and attach speed washers.

5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.05 FINISHES

- A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 09 Painting Sections.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.06 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
 1. Indoor concealed supply-, return-, and outside-air ductwork.
 2. Indoor exposed supply-, return-, and outside-air ductwork.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 1. Fibrous-glass ducts.
 2. Metal ducts with duct liner.
 3. Factory-insulated flexible ducts.
 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 5. Flexible connectors.
 6. Vibration-control devices.
 7. Testing agency labels and stamps.
 8. Nameplates and data plates.
 9. Access panels and doors in air-distribution systems.

3.07 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Round, supply-air ducts, concealed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 3 inches.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- B. Service: Round, return-air ducts, concealed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 2 inch.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- C. Service: Rectangular, supply-air ducts, concealed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 3 inches.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- D. Service: Rectangular, return-air ducts, concealed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 2 inch.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- E. Service: Round, supply-air ducts, exposed, in non-conditioned room.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 3 inches.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- F. Service: Round, return-air ducts, exposed, in non-conditioned room.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 2 inch.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- G. Service: Rectangular, supply-air ducts, exposed, in non-conditioned room.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 3 inches.
 - 3. Number of Layers: One.
 - 4. Vapor Retarder Required: Yes.
- H. Service: Rectangular, return-air ducts, exposed, in non-conditioned room.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inch.
3. Number of Layers: One.
4. Vapor Retarder Required: No.

END OF SECTION

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SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Condensate drain piping, indoors.
 - 2. Refrigerant suction and hot-gas piping, indoors and outdoors.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.07 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000-Degree Pipe Insulation.

- c. Owens Corning; Fiberglas Pipe Insulation.
- 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket.

2.02 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for

appropriate coating materials and application methods for operating temperature range.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.04 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 1. Comply with requirements in Section 07 84 00 "Firestopping" for firestopping and fire-resistive joint sealers.
- D. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 00 "Firestopping."

3.05 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

3.06 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.07 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.09 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):
 - 1. All Pipe Sizes: Insulation shall be the following: Retain one or more of six subparagraphs below.
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.
- B. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Flexible Elastomeric: 1 inch thick.
- C. Refrigerant Suction and Hot-Gas Flexible Tubing:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Flexible Elastomeric: 1 inch thick

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
 - b. Flexible Elastomeric: 1-1/2 inch thick.
- B. Refrigerant Suction and Hot-Gas Flexible Tubing:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
 - b. Flexible Elastomeric: 1-1/2 inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:

1. None.
- D. Piping, Exposed:

1. None.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
1. None.
- D. Piping, Exposed:
1. PVC: 30 mils thick.

END OF SECTION

SECTION 230900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature control system, utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
- B. All labor, material, equipment, and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

1.02 SYSTEM DESCRIPTION

- A. The entire temperature control system shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark/LonTalk communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be manufactured by Honeywell. Equivalent LonWorks products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal.
- B. The Temperature Control System as provided in this Division shall be based on the Honeywell WEBs System incorporating the Niagara Framework™. Equivalent products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal. Systems not developed on the Niagara Framework platform are unacceptable.

1.03 SUBMITTAL

- A. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package.
- B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.
- C. Submittal shall also include a complete point list of all points to be connected to the temperature control system. Controls Contractor shall provide necessary point lists, protocol documentation, and factory support information for systems provided.

- D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.
- E. Include the following display graphics for each of the sites:
- F. Site plan view of entire campus identifying each building – include the display of outside air temperature & humidity.
 - 1. Individual buildings, including room layout with display of all space temperatures and occupied mode, outside air temperature & humidity.
 - 2. Mechanical equipment display for each AC unit to include space temperature, heating and cooling setpoints, supply air temperature, fan status, occupied mode, outside temperature & humidity.
 - 3. Boiler and hot water pumps showing all related points.
 - 4. Page showing all room temperatures, room temperature setpoints, occupied mode, AC unit fan status and AC unit mode (heating or cooling).
- G. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Controls Contractor shall provide as-builts for their portions of work.

1.04 SPECIFICATION NOMENCLATURE

- A. Acronyms used in this specification are as follows:

NAC	Network Area Controller
IDC	Interoperable Digital Controller
IBC	Interoperable BACnet Controller
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement

1.05 AGENCY AND CODE APPROVALS

- A. All products of the temperature control system shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 - 1. UL-916; Energy Management Systems
 - 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"

3. CE
4. FCC, Part 15, Subpart J, Class A Computing Devices

1.06 SOFTWARE LICENSE AGREEMENT

- A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
- B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner. The owner shall determine which organizations to be named in the SI organization ID ("orgid") of all software licenses. Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.08 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

PART 2 - MATERIALS

2.01 ACCEPTABLE CONTROL MANUFACTURER/CONTRACTOR

- A. Honeywell "Authorized Controls Integrator Elite" –
R & R Controls Inc.
4564 B Alvarado Canyon Road
San Diego, CA 92120
ph. 619-516-1880
fx. 619 516-1881

2.02 GENERAL

- A. The temperature control system shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network

devices, valves, dampers, sensors, and other devices as specified herein. All systems and software within temperature control system shall be Year 2000 compliant and shall be supported by compliance documentation from the manufacturer.

- B. The installed system shall provide secure password access to all features, functions and data contained in the overall temperature control system.

2.03 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet, LonWorks technology, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.
- C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
 - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.04 NETWORKS

- A. The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE standard 802.3
2. Cable; 100 Base-T, UTP-8 wire, category 5
3. Minimum throughput; 100 Mbps.

2.05 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.06 NETWORK AREA CONTROLLER (NAC)

A. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of LonWorks controller data and BACnet controller data
7. Network Management functions for all LonWorks based devices

B. The Network Area Controller must provide the following hardware features as a minimum:

1. One Ethernet Port – 10/100 Mbps
2. One RS-232 port
3. One LonWorks Interface Port – 78KB FTT-10A
4. One RS-485 ports
5. Battery Backup
6. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
7. The NAC must be capable of operation over a temperature range of 32 to 122°F
8. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
9. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.

- C. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- E. Event Alarm Notification and actions
 - 1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
 - 2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
 - 3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
 - a. To alarm
 - b. Return to normal
 - c. To fault
 - d. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
 - 4. Provide timed (schedule) routing of alarms by class, object, group, or node.
 - 5. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
- F. Control equipment and network failures shall be treated as alarms and annunciated.
- G. Alarms shall be annunciated in any of the following manners as defined by the user:
 - 1. Screen message text
 - 2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
 - a. Day of week
 - b. Time of day
 - c. Recipient
 - 3. Pagers via paging services that initiate a page on receipt of email message.
 - 4. Graphic with flashing alarm object(s)
 - 5. Printed message, routed directly to a dedicated alarm printer.
- H. The following shall be recorded by the NAC for each alarm (at a minimum):
 - 1. Time and date
 - 2. Location (building, floor, zone, office number, etc.)
 - 3. Equipment (air handler #, access way, etc.)
 - 4. Acknowledge time, date, and user who issued acknowledgement.
 - 5. Number of occurrences since last acknowledgement.

- I. Alarm actions may be initiated by user defined programmable objects created for that purpose.
- J. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
- K. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.
- L. Provide a “query” feature to allow review of specific alarms by user-defined parameters.
- M. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
- N. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.07 DATA COLLECTION AND STORAGE

- A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.
- B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
 - 1. Designating the log as interval or deviation.
 - 2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 - 3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 - 4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 - 5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
- C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.
- D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
- E. All log data shall be available to the user in the following data formats:
 - 1. HTML
 - 2. XML
 - 3. Plain Text
 - 4. Comma or tab separated values
- F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
- G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached its user-defined capacity of data stores
4. Provide ability to clear logs once archived.

2.08 AUDIT LOG

- A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
 1. Time and date
 2. User ID
 3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.09 DATABASE BACKUP AND STORAGE

- A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
- B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
- C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.10 INTEROPERABLE DIGITAL CONTROLLER (IDC)

- A. Controls shall be Honeywell Excel 10 microprocessor based Interoperable LonWorks Controllers (IDC) or approved equal. Where possible, all Interoperable Digital Controllers shall bear the applicable LonMark™ interoperability logo on each product delivered.
- B. HVAC control shall be accomplished using LonMark™ based devices where the application has a LonMark profile defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device. Publicly available specifications for the Applications Programming Interface (API) must be provided for each LonWorks / LonMark controller defining the programming or setup of each device. The Controls Contractor shall provide all programming, documentation and programming tools necessary to set up and configure the supplied devices per the specified sequences of operation.
- C. The Controls Contractor shall run the LonWorks network trunk to the nearest Network Area Controller (NAC). Coordinate locations of the NAC to ensure that maximum network wiring distances, as specified by the LonWorks wiring guidelines, are not exceeded. A maximum of 126 devices may occupy any one LonWorks trunk and must be installed using the appropriate trunk termination device. All LonWorks and LonMark devices must be supplied using FTT-10A LonWorks communications transceivers.

- D. The Network Area Controller (NAC) will provide all scheduling, alarming, trending, and network management for the LonMark / LonWorks based devices.
- E. The IDCs shall communicate with the NAC at a baud rate of not less than 78.8K baud. The IDC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- F. All IDCs shall be fully application programmable and shall at all times maintain their LONMARK certification, if so certified. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
- G. The Controls Contractor supplying the IDC's shall provide documentation for each device, with the following information at a minimum:
 - 1. Network Variable Inputs (nvi's); name and type
 - 2. Network Variable Outputs (nvo's); name and type
 - 3. Network configuration parameters (nci, nco); name and type
- H. It is the responsibility of the Division 15 contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) are provided in each IDC, as required by the point charts.
- I. The supplier of any programmable IDC shall provide one copy of the manufacturer's programming tool, with documentation, to the owner.

2.11 GRAPHICAL USER INTERFACE SOFTWARE

- A. **Operating System:** *WEBSTATION-AX™*
- B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
- C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
 - 1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
 - 2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
 - 3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
 - 4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.

- a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - b. Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.
5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
- D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
 1. Create, delete or modify control strategies.
 2. Add/delete objects to the system.
 3. Tune control loops through the adjustment of control loop parameters.
 4. Enable or disable control strategies.
 5. Generate hard copy records or control strategies on a printer.
 6. Select points to be alarmable and define the alarm state.
 7. Select points to be trended over a period of time and initiate the recording of values automatically.
- E. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
- F. Security. Each operator shall be required to log on to that system with a username and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
- G. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
- H. Alarm Console
 1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
 2. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed

by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

2.12 WEB BROWSER CLIENTS

- A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
 - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
 - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
 - 4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 - 5. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
 - 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - b. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - c. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - d. Commands to start and stop binary objects shall be done by right clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

- e. View logs and charts
 - f. View and acknowledge alarms.
 - g. Setup and execute SQL queries on log and archive information.
7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
 8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.13 SERVER FUNCTIONS AND HARDWARE

- A. An existing central server, located at the Grossmont Union High School District's Maintenance Office. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.
- B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
- C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
- D. The server shall provide the following functions, at a minimum:
 1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
 2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
 3. **The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).**
 4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
 5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
 6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
 7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
 8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.

9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
 - a. Routing of alarms to display, printer, email and pagers.
 - b. View and acknowledge alarms.
 - c. Query alarm logs based on user-defined parameters.
10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
 - a. Viewing and printing log data
 - b. Exporting log data to other software applications
 - c. Query log data based on user-defined parameters.

2.14 SYSTEM PROGRAMMING

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.
- B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built-in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide “real-time” data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.
- C. Programming Methods
 1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user’s application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link, i.e., internal, external, hardware, etc.
 2. Configuration of each object will be done through the object’s property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
 3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.

4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.15 LonWorks NETWORK MANAGEMENT

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as "binding". Systems requiring the use of third party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.16 OBJECT LIBRARIES

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
- B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACnet specification.
- E. The library shall include applications or objects for the following functions, at a minimum:
 1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.

2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical “point-and-click” selection. This object must be “linkable” to any or all scheduling objects for effective event control.
 3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals.
 4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
 5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building’s “flywheel” effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day’s performance.
 6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to affect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the user’s screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to affect both equipment protection and occupant comfort.
- F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.
1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
 2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
 3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the

amount of time the hardware input is in an “on” condition. The user must be able to specify either input condition as the “on” condition.

4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an “On” state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering,

or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the “contained” application that are represented on the graphical shell of this container.

- G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.
 2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
 3. For BACnet devices, provide the following objects at a minimum:
 - a. Analog In
 - b. Analog Out
 - c. Analog Value
 - d. Binary
 - e. Binary In
 - f. Binary Out
 - g. Binary Value
 - h. Multi-State In
 - i. Multi-State Out
 - j. Multi-State Value
 - k. Schedule Export
 - l. Calendar Export
 - m. Trend Export
 - n. Device
 4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
 5. For BACnet devices, provide the following support at a minimum
 - a. Segmentation
 - b. Segmented Request
 - c. Segmented Response
 - d. Application Services
 - e. Read Property
 - f. Read Property Multiple
 - g. Write Property
 - h. Write Property Multiple

- i. Confirmed Event Notification
- j. Unconfirmed Event Notification
- k. Acknowledge Alarm
- l. Get Alarm Summary
- m. Who-has
- n. I-have
- o. Who-is
- p. I-am
- q. Subscribe COV
- r. Confirmed COV notification
- s. Unconfirmed COV notification
- t. Media Types
- u. Ethernet
- v. BACnet IP Annex J
- w. MSTP
- x. BACnet Broadcast Management Device (BBMD) function
- y. Routing

2.17 MODBUS SYSTEM INTEGRATION

- A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.
- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
 - 1. Read/Write Modbus AI Registers
 - 2. Read/Write Modbus AO Registers
 - 3. Read/Write Modbus BI Registers
 - 4. Read/Write Modbus BO Registers
- C. The Network Area Controller shall perform all scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices.
- D. The Controls Contractor shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning.

2.18 OTHER CONTROL SYSTEM HARDWARE

- A. Space Temperature Wall Module. Wall Module shall be Honeywell or equivalent.
 - 1. Wall module shall have a 20K Ohm NTC thermistor temperature sensor with operating range of 45 to 99 F under a locking cover/enclosure with UL 916 listing designed for mounting on a standard electrical switch box.

2. Space temperature sensors shall be accurate to plus or minus one F degree.
 3. Where specified, space temperature sensors shall have a setpoint knob calibrated for warmer-cooler adjustments.
 4. Where specified, wall module shall also have an after-hours override pushbutton and LED override indicator.
 5. **Insulating foam** shall be installed on the back of all space temperature wall modules to prevent air infiltration from wall opening.
- B. Duct Mount and Outside Air Temperature Sensors: Temperature sensors with an accuracy of + 0.3° F. Temperature sensors shall be Honeywell or equivalent.
1. Outside air sensors shall include an integral sun shield.
 2. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
 3. Multipoint averaging element sensors shall be provided where specified and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
 4. Pipe mount sensors shall have copper, or stainless-steel separable wells.
- C. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition and a current level below trip set point.
- D. Humidity Sensors. Humidity sensors shall be Honeywell or equivalent.
1. Duct and room sensors shall have a sensing range of 5% to 95%.
 2. Duct sensors shall be provided with a sampling chamber.
 3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall have a compensated ambient temperature range of -40°F to 170° F.
- E. Control Panels: Furnish control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. All external wiring shall be connected to terminal strips mounted within the panel. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All work described in this section shall be performed by a Honeywell "Authorized Controls Integrator" that has a successful history in the design and installation of integrated control systems using Niagara Framework™. The installing contractor shall have a local office located within **20 miles** from **Grossmont Union High School District** and a minimum of **ten** years of integration experience installing Honeywell DDC control systems and shall provide documentation in the submittal package verifying the company's experience.

- B. The Controls Contractor shall have employees at the local branch that are fully trained and certified for the Honeywell WEBs Systems incorporating Niagara Framework™. Copies of the employees Niagara Training Certificates shall be included in the submittals.
- C. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- D. Drawings of the temperature control system network are diagrammatic only and any apparatus not shown but required to make the system operative to the complete satisfaction of the Owner shall be furnished and installed without additional cost.
- E. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.
- F. Controls Contractors shall have a C-10 License in good standing in the state of California.

3.02 WIRING

- A. All electrical control wiring and power wiring to the control panels, NAC, computers, and network components shall be installed in conduit and be the responsibility of the Controls Contractor.
- B. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All temperature control system wiring shall be installed in the conduit types allowed by the National Electrical Code or applicable local codes. Where plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.
- C. Echelon Compliant Direct Burial Cable shall be used for all underground communication bus wiring between buildings to prevent damage from moisture. The existing underground conduit systems are not watertight.

3.03 WARRANTY

- A. Equipment, materials, and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

3.04 WARRANTY ACCESS

- A. The Owner shall grant to this contractor, reasonable access to the temperature control system during the warranty period.
- B. The owner shall allow the contractor to access the temperature control system from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.05 SOFTWARE LICENSE

- A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). The owner, or his appointed agent, shall determine which organizations to be named in the “orgid” of all Niagara Framework software licenses.
- B. The owner, or his appointed agent, shall be free to direct the modification of the “orgid” in any Niagara Framework software license, regardless of supplier.
- C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the owner.

3.06 ACCEPTANCE TESTING

- A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.
- B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
- D. System Acceptance: Satisfactory completion is when this contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.07 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the temperature control system hardware and software has been established this contractor shall provide both off-site and on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by factory-trained personal that are familiar with the system hardware, software, and accessories.
- B. This contractor shall provide 4 hours of instruction to the owner's designated personnel on the operation of the temperature control system and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate

operator intervention required in responding to the System's operation. Contractor to provide local training facility that will accommodate up to 12 school district employees.

END OF SECTION

SECTION 23 09 80
MECHANICAL COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

- A. Commissioning is a designed process of documentation, training, adjustment, testing, and verification performed to ensure that the finished facility operates as intended. Provide complete and operational commissioned mechanical systems. The commissioning requirements specified in this section are in addition to the requirements specified in other sections of specifications for this project.

1.02 SECTION INCLUDES

- A. This section includes the systematic process of commissioning for all sections of Division 23.
 - 1. Commissioning Plan.
 - 2. Commissioning Schedule.
 - 3. Commissioning Basis of Design.
 - 4. Commissioning One-Line Diagrams.
 - 5. Code Compliance Verification.
 - 6. Installation Verification.
 - 7. Control Software Verification.
 - 8. Start-Up Verification.
 - 9. Test, Adjust, and Balance (TAB) Verification.
 - 10. Commissioning Procedure.
 - 11. Functional Performance Test.
 - 12. Operations and Maintenance (O & M) Manuals Verification.
 - 13. Owner Training Verification.
 - 14. Seasonal Commissioning & Occupancy Variation

1.03 EQUIPMENT UTILIZED UNDER THIS SECTION

- A. Provide the required instruments and components for measurements, verifications, and full commissioning of mechanical systems.
- B. Calibrate the instruments and components in accordance with National Institute of Standards and Technology (NIST).

1.04 RELATED DIVISIONS

- A. Related Divisions include Division 2, Division 22, Division 23 and Division 26.

1.05 REFERENCES

- A. ASHRAE: American Society of Heating Refrigerating and Air Conditioning Engineers. The HVAC Commissioning Process ASHRAE Guidelines 1-1996.

- B. NIST: National Institute of Standards and Technology.
- C. NEBB: National Environmental Balancing Bureau Procedural Standards for building systems commissioning – latest edition.
- D. AABC: Associated Air Balance Council. The AABC Commissioning Guideline.

1.06 QUALITY ASSURANCE

- A. Commissioning Authority: The commissioning authority is the designated company that implements the overall commissioning. The commissioning authority shall have commissioned minimum five projects of similar scope to this project in the last five years.
- B. Test Engineer: The Test Engineer is the person employed by the Commissioning Authority who actually performs the test. The Test Engineer shall have a minimum of three years of experience in Commissioning and a minimum of three years of experience in start-up of similar mechanical systems specified in this project. Obtain prior approval.
- C. Commissioning Agent: The commissioning agent is the person employed by the commissioning authority who oversees the commissioning process and assures coordination with other trades. The commissioning agent shall have a minimum of three years of experience in commissioning and minimum five years of experience in start-up of similar mechanical systems. Obtain prior approval.

1.07 COORDINATION

- A. Coordination and management: Provide overall coordination and management of the commissioning program. The commissioning team shall be comprised of: contractors, subcontractors, commissioning authority, and owner representatives.
- B. Assure all applicable forms are submitted and are complete for each section of Division 23. The commissioning performed under this section is in addition to commissioning performed by the manufacturer and contractors for each section of Division 23 or each piece of equipment.

1.08 QUALITY ASSURANCE FOR CONTRACTOR'S SHOP DRAWINGS

- A. The shop drawings shall be reviewed and approved by the commissioning authority prior to construction. Assure proper coordination between trades. Assure proper access for service. Review and discuss at monthly commissioning meetings.
- B. Assure the electrical requirements of the actual equipment supplied by mechanical contractor are verified, reviewed, and coordinated with electrical and other trades. Review and discuss at monthly commissioning meetings.
- C. A copy of all mechanical submittals shall be submitted to commissioning authority for review, reference, and coordination.

1.09 SUBMITTALS

- A. Commissioning Quality Assurance: Submit qualification years of experience, certifications, resumes and company profile.
 - 1. Commissioning Authority qualifications and certifications.
 - 2. Test Engineer qualifications.
 - 3. Commissioning Agent qualifications.

- B. General: Submit the following in accordance with general and supplemental conditions of the contract and Division 1 specification sections. Submit a comprehensive and detailed commissioning package within thirty (30) days upon authorization to proceed. The commissioning package shall include all the required submittal items, plans, forms, schedules, and procedures in a 3-ring binder with a detailed table of contents. Upon completion of the commissioning process, resubmit the entire commissioning package along with results, certified forms, and requirements.
1. Commissioning Plan.
 2. Commissioning Schedule.
 3. Commissioning Basis of Design.
 4. Commissioning One-Line Diagrams.
 5. Code Compliance Verification.
 6. Installation Verification.
 7. Control Software Verification.
 8. Start-Up Verification.
 9. Test, Adjust, and Balance (TAB) Verification.
 10. Commissioning Procedure.
 11. Functional Performance Test.
 12. Operations and Maintenance (O & M) Manuals Verification.
 13. Owner Training Verification.
 14. Commissioning Authority Qualifications.
 15. Test Engineer Qualifications.
 16. Commissioning Agent Qualifications.

1.10 COMMISSIONING MEETINGS

- A. Schedule, organize, and coordinate commissioning meetings. The commissioning agent shall lead these meetings. Request attendance of the owner and end-users, and owner's maintenance/staff. Provide a comprehensive agenda to all participants seven calendar days prior to each meeting. Compile and distribute meeting minutes to all participants within seven calendar days after each meeting. The construction coordination meetings by the general contractor are not a substitution for a commissioning meeting. Commissioning meetings shall be conducted in addition to the construction coordination meetings.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide test equipment, instruments, components, and tools as required for a complete commissioning of the mechanical system.

2.02 QUALITY CONTROL

- A. Verify that equipment is calibrated properly in conformance with National Institute of Standards and Technology (NIST) and NEBB requirements.

PART 3 - EXECUTION

3.01 COMMISSIONING PLAN

- A. Develop a commissioning plan and identify all commissioning activities. The intent of the commissioning plan is to expose all critical issues and resolve them with input from the construction team at early stages of planning.
- B. Identify responsible parties for producing various procedures, reports, Owner Notifications, and forms. Discuss and confirm at monthly commissioning meetings.
- C. Describe the testing and acceptance method for each system. Provide applicable forms. Complete forms to assure acceptable compliance.
- D. Clearly identify each subcontractor's responsibilities and participation in each test.
- E. Clearly identify instruments for each test.
- F. Provide an operational description, defining design criteria, design intent, code requirements, specifics of the equipment to be provided, sequence of operation, operating priorities, and protocols.
- G. 72 Hour Trend Data: Provide 72 hour trend data of all DDC points utilizing the building automation system in accordance with Section 15 95 0. The trend data shall verify the proper operation of all components, equipment and the system. Coordinate with the building automation contractor. Provide separate 72 hour trend data report for heating and cooling modes.
- H. Review the sequence of operation in detail. Assure there is a meaningful plan for implementation. Verify the sequence of operation meets the owner's use requirements. Review and discuss at monthly commissioning meeting.
- I. Request a list of all mechanical equipment with potential for excessive noise and vibration. Field verify the actual location of these equipment. Review and discuss at monthly commissioning meetings.
- J. Field verify and review the outside air intake openings to the building. Examine the approximate exhaust air discharge and plumbing vents. Review and discuss at monthly commissioning meetings.
- K. Request a list of all mechanical equipment and controllers that require emergency power supply. Verify compliance. Review and discuss at commissioning meetings.
- L. Coordinate the entire commissioning plan with control subcontractor and other trades.

3.02 COMMISSIONING SCHEDULE

- A. Integrate functional performance testing and commissioning requirements into the Critical Path Method (CPM) master construction schedule.
 - 1. Prior to the beginning of start-up or functional performance testing activities, update the schedule of commissioning activities.
 - 2. Two weeks prior to the beginning of start-up or functional performance testing activities, provide a detailed two-week look-ahead schedule. The two-week look-ahead schedule shall identify the date, time, beginning location, contractor personnel required, and anticipated duration for each start-up or test activity.

- B. Commissioning of systems shall proceed per the criteria established in the specific sections that follow with activities to be performed on a timely basis. Commissioning of systems may proceed prior to final completion of systems. The Test Engineer must be available to respond promptly to avoid delay to the CPM Schedule.
- C. Problems observed shall be addressed immediately in terms of notification to responsible parties and the engineer. Take actions to correct deficiencies.
- D. Coordination with Owner's Representatives:
 - 1. The commissioning authority shall notify Owner's Representative when start-up and test activities are to take place.
 - 2. Notify the Owner's Representative in writing of the date, time, location, and anticipated duration of start-up and test activities as required in schedule above.
 - 3. Provide written timely notice to Owner's Representative of any changes in date, time, location or anticipated duration of start-up, and test activities. A minimum of 72 hours in advance is required.
- E. Provide a complete and comprehensive schedule for commissioning. Present this schedule in a Microsoft Project format. Coordinate with all parties.

3.03 COMMISSIONING BASIS OF DESIGN

- A. Prepare commissioning basis of design narratives. Incorporate the effect of approved substitution requests, change orders and responses to requests for clarifications. Basis of design includes design criteria and operation descriptions for systems.
 - 1. Design criteria shall include design conditions for each space as follows: indoor dry bulb temperature; indoor relative humidity; outdoor dry bulb temperature; outdoor wet bulb temperature; occupancy and hours.
 - 2. Operations description shall include design intent, basic system type, capacity and sizing criteria, redundancy, diversity, automatic temperature control and sequence of operation, intended operation under all seasonal loads, changeover procedures, part-load strategies, occupied/unoccupied modes of operation, design setpoints of control systems with permissible adjustments, operation of system components in life-safety modes, energy conservation procedures, and any other engineered operational mode of the systems.
 - 3. Review the construction documentation detail. Provide a narrative indicating anticipated issues that may impact start-up, test and balance, and commissioning process.
- B. Prepare and update final commissioning basis of design incorporating any changes to the system, equipment, etc. that took place during construction, start-ups, functional testing, etc.

3.04 COMMISSIONING ONE-LINE DIAGRAMS

- A. Provide commissioning one-line diagrams. Incorporate the effect of approved substitution requests, change orders and responses to requests for clarifications. One-line diagrams shall include, but not be limited to; air distribution and hydronic flow as well as control schematics.
 - 1. Provide one-line diagrams for the HVAC supply and return air system. Indicate the specified CFM for each zone. Verify the overall routing and balancing criteria.

2. Provide one-line diagrams for CHW, HW and other mechanical systems. Verify the overall balancing scheme.
3. One-line diagrams are intended to support narrative system descriptions, commissioning Basis of Design, and the overall commissioning process.
4. Examine the construction site to assure proper passage for return air in accordance with the one-line diagram.
5. Verify the overall building pressurization scheme in reference to outside air, supply air and exhaust air.

3.05 CODE COMPLIANCE VERIFICATION

- A. Review the contractor's shop drawings, generate a report and assure full compliance with California Mechanical Code (CMC), California Plumbing Code (CPC), and National Fire Protection Agency (NFPA), as well as other governing codes. There shall be no exception. Report deficiencies prior to ordering and installing materials. Verify installation compliance upon completion of the project. Verify completion of all required sign offs from regulatory agencies.

3.06 INSTALLATION VERIFICATION

- A. Observation Reports: During construction, observe the work of the prime HVAC and plumbing contractors and subcontractors to ensure that all installations are being made in accordance with the intent of the contract documents. Provide a one page "HVAC Commissioning Observation Report" and a one page "Plumbing Observation Report". Present these at the commissioning meeting.
- B. Before system start-up begins, conduct, document and publish a final installation verification audit/report for both mechanical and plumbing installations. The audit shall include, but not be limited to, a check of:
 1. Piping specialties including balance, control, and isolation valves.
 2. Ductwork specialty items including turning devices, balance, fire, smoke, and control dampers, and access doors.
 3. Control sensor types and locations.
 4. Identification of piping, valves, starters, gauges, and thermometers.
 5. Documentation of prestart-up tests performed.
 6. Report deficiencies in regards to any non-ducted supply/return air pathways that may be obstructed by walls or other obstacles.
- C. Verify that the plumbing installation meet the specified guidelines and applicable codes. This, as a minimum, shall include the following:
 1. Verification of proper access to plumbing components and valves.
 2. Verification of proper labeling of pipes and components.
 3. Verification of successful completion of specified tests.
 4. Verification of compliance with CPC and ADA requirements.
- D. If any work is found to be incomplete, inaccessible, incorrect, or non-functional, make note of deficiencies, report and correct the deficiencies before system start-up work proceeds.

- E. Upon installation of all equipment, devices, vibration isolators, etc., provide a written confirmation from manufacturer's representative indicating such devices are installed and operating within manufacturer's recommendations and tolerances.

3.07 CONTROL SOFTWARE VERIFICATION

- A. Verify all the required graphic presentations are completed.
- B. Verify the room numbers are updated and correct.
- C. Verify the equipment numbering methods are conducted and meet the facility standards.
- D. Verify that a graphic presentation is shown in each zone.
- E. Verify compatibility and compliance with other equipment as specified.
- F. Verify interface with other systems where specified.
- G. Verify proper software applications for 72-hour trending.
- H. Verify proper programming for the sequence of operation.
- I. Verify proper software licenses are provided to the owner.
- J. Provide a compliance report confirming the results of control software verification as described herein.

3.08 START-UP VERIFICATION

- A. Verify that the start-up procedures recommended by manufacturers are coordinated.
- B. Coordinate and notify Owner of start-up activities. Schedule at least three working days in advance. Commissioning Authority shall physically witness start-up procedures.
- C. Verify that start-up deficiency list forms are prepared to report deficiencies discovered in conjunction with system start-up. Start-up deficiency forms shall indicate the system being started-up; the location and identification of the deficient equipment/material; date of observation; initials of the observer; observed deficiency; date of correction; initials of person making the correction; and corrective action taken.
- D. Issue start-up deficiency report forms to the Contractor for corrective action. Assure and document that all start-up deficiency list items have been corrected. Document compliance.

3.09 TEST, ADJUST, AND BALANCE (TAB) VERIFICATION

- A. Coordinate with air and hydronic balancing contractor. Advise the TAB firm when systems are complete and ready for balancing.
- B. Field verify the conditions above ceiling before ceiling tiles are installed.
- C. Verify the completion of the TAB work prior to commencing any Functional Performance Test (FPT) activities that may be adversely affected by improper balancing.
- D. Randomly check the air and hydronic balancing at the presence of the owner's representative and the mechanical engineer. Document compliance.

3.10 COMMISSIONING PROCEDURE

- A. Sequence of Testing: Commissioning shall proceed from lower to higher levels of complexity. In general, the order of testing from lowest to highest is:
 - 1. Component functional performance tests (of motors, actuators, sensors, VFD's, etc.) and start-up.

2. Equipment functional performance tests (safety devices, low load conditions, etc.).
 3. Subsystems functional performance tests.
 4. System functional performance tests.
- B. Retesting: Repeat, at no additional cost to the owner, the complete functional test procedure for each test for which acceptable results are not achieved. Repeat test until acceptable results are achieved. Fill out a new functional performance test data form for each retest.
 - C. Testing of VFD's: Assure that all the VFD's are tested and balanced by the factory and test and balance company. Verify that unstable frequency ranges are by-passed. Perform random testing to verify. Assure final settings are accurate.
 - D. Assure that the commissioning performed by the mechanical contractor and equipment manufacturer for other sections of Division 23 are in conformance with specified requirements.
 - E. Correction of Deficiencies:
 1. Correct functional performance test deficiencies promptly and schedule retest.
 2. Corrections during functional performance test are generally prohibited to avoid consuming the time of personnel waiting for the test, but not involved in making the correction. Exceptions will be allowed if the cause of the failure is obvious and corrective action can be completed in less than five minutes.
 - F. Owner's Witnesses: Witnesses will be designated by the Owner to observe the commissioning process. Owner's witnesses shall provide no labor or materials in the commissioning process. The only function of the Owner's witnesses shall be to observe and comment on the progress and results of commissioning.

3.11 FUNCTIONAL PERFORMANCE TEST

- A. Initiate, develop, and document functional performance test procedures. Include functional performance test procedures data sheets for each component, equipment and the system. Determine actual system performance and compliance with the design. Personnel experienced in the technical aspects of each system to be commissioned shall be engaged.
- B. Test procedures shall fully describe system configuration and steps required for each test and be appropriately documented so that another party can repeat the tests with virtually identical results.
- C. Acceptance test procedures must confirm the performance of systems. Comply with the requirements of the contract documents. The acceptance test shall meet the design intent and applicable code under which the project was permitted. When a system is accepted, the Commissioning Authority must be assured that the system is complete, works as intended, is correctly documented, and that the Owner's staff is trained in the operation and maintenance of the system.
- D. The mechanical equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met. This shall include adequate oil pressure, proof-of-flow, non-freezing conditions, and maximum head pressure. Functional performance test procedures shall demonstrate the actual performance of safety shutoffs in real or closely-simulated conditions of failure. Document compliance.
- E. Notify all personnel on the project site prior to any start-up or testing which may create a hazardous or dangerous condition. Coordinate with other trades.

1. Functional Performance Test (FPT) Procedures:
 - a. Each procedure shall have a unique alphanumeric designator.
 - b. The same procedure may be applied to multiple identical pieces of equipment or systems.
 - c. Procedures shall reference the applicable specification section upon which the procedure is based.
 - d. These procedures will be reviewed for technical depth, clarity of documentation, and compliance with acceptance criteria.
 - e. Identify the value for all setpoints and inputs, positions of adjustable devices, including valves, dampers, and switches.
 - f. Identify the range of acceptable results for each condition tested.
 - g. FPT procedures shall be detailed test instructions, written with sufficient step-by-step information to allow a test to be repeated under identical conditions with repeatable results.
 2. Functional Performance Test (FPT) Data Forms:
 - a. Identify each functional performance test data form by a unique designator consisting of the applicable functional performance test procedure designator followed by a dash digit suffix to distinguish multiple repetitions of the same procedure.
 - b. Include space to record the following: description of the procedure; whether the form is for a retest of a failed procedure; identification and location of the equipment being tested; identification of instrumentation used by serial number; observed conditions at each step of the procedure; acceptable results as specified elsewhere; date of the test; names of technicians performing the procedure; name and signature of the Test Engineer; and name and signature of the Commissioning Authority or Owner-designated witness. Signature of witness shall only indicate concurrence with reported results and observations. Acceptance of the results will be reported separately by the Commissioning Authority after review of the FPT data forms.
 3. Functional Performance Test Deficiency Report Forms: Include space to record the following: Associated functional performance test data form number; date of test; name of person reporting the deficiency; description of the observations associated with the failure of the test; cause of the failure, if apparent at the time of the test; date and description of corrective action taken; name and signature of person taking corrective action; and schedule for retest.
- F. Verify proper operation of LON, LAN, or gateway connections to VFD's and other equipment. Verify that all the required information is actually available at the operator's station.

3.12 OPERATIONS AND MAINTENANCE (O & M) MANUALS VERIFICATION

- A. Review, verify and approve the accuracy of O & M manuals of the work related to commissioning for compliance with the requirements of Division 1 and Division 23.
- B. Assure O & M manuals are concise, to the point, and tailored specifically to this facility.

- C. Assure O & M manuals include standard technical literature relevant to the operation and maintenance of the provided equipment. The literature shall be specifically oriented to the equipment provided, indicating all operation and maintenance procedures, parts lists, assembly/disassembly diagrams, and related information. Wiring diagrams must be complete and specific to the equipment provided. Document compliance.

3.13 OWNER TRAINING VERIFICATION

- A. The purpose of owner training verification is to assure coordination between various sections of Division 23 and to assure the owner's appropriate personnel receive adequate training. In addition to the training specified under other sections of Division 23, provide 40 hours of total building operation training for mechanical systems.
- B. Coordinate and provide a master training schedule for all Division 23 training requirements for components, equipment, and systems. Present the master training schedule in a Microsoft Office program. Assure training is provided for all critical items. Assure the presenters are qualified. Verify the competency of the owner operators. The training plan shall include the following for each training session:
 - 1. Dates, start and finish times, and locations.
 - 2. Outline of the information to be presented.
 - 3. Names and qualifications of presenters.
 - 4. List of texts and other materials required to support training.
 - 5. Names and positions of those attending.
- C. Obtain assistance from appropriate subcontractors and vendors to provide training for the Owner's operations staff.
- D. Provide videotape documentation of training of the Owner's staff for each system. Training shall be in a classroom setting with the appropriate schematics, hand-outs, and audio/visual training aids. A copy of the training videotape shall be included in the final commissioning report.
- E. Catalog all training videotapes and deliver to the Owner with the O & M manuals.
- F. Host each training session:
 - 1. Provide program overview and curriculum guidance.
 - 2. Obtain signatures of attendees on a sign-in list.
- G. Equipment vendors shall provide training on the specifics of each system and philosophy, troubleshooting, and repair techniques as specified in the relevant sections of this specification.
- H. Installation subcontractors shall provide training on peculiarities specific to this project and job specific experience as specified in the relevant sections of this specification.
- I. Verify emergency procedures and verify disaster recovery plans. Emergency procedures have been provided in the training sessions.

END OF SECTION

SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.
- B. Related Sections include the following:
 - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."
 - 2. Division 23 Section "Instrumentation and Control for HVAC" for control equipment and devices and submittal requirements.

1.03 SUBMITTALS

- A. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- B. Submit detailed sequence of operation for each piece of equipment with the control drawings.

1.04 DEFINITIONS

- A. DDC: Direct-digital controls.

1.05 EXHAUST FAN CONTROL

- A. Existing control for each existing exhaust fan to remain.

1.06 AIR CONDITIONING UNIT CONTROL

- A. Existing control for each existing air conditioning unit and zone control damper to remain. Reprogram and adjust existing control parameters as required to provide a fully functional system.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

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SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.02 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Shop Drawing Scale: 1/4 inch equals 1 foot (1:50).
 - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.04 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.07 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.08 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.02 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig (3450 kPa).
 - 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- B. Packed-Angle Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze.
 - 2. Packing: Molded stem, back seating, and replaceable under pressure.
 - 3. Operator: Rising stem.
 - 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.

5. Seal Cap: Forged-brass or valox hex cap.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Working Pressure Rating: 500 psig (3450 kPa).
 8. Maximum Operating Temperature: 275 deg F (135 deg C).
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 3. Piston: Removable polytetrafluoroethylene seat.
 4. Closing Spring: Stainless steel.
 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 275 deg F (135 deg C).
- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig (3450 kPa).
- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and [24] [115] [208]-V ac coil.
 6. Working Pressure Rating: 400 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig (2760 kPa).

6. Maximum Operating Temperature: 240 deg F (116 deg C).
- G. Thermostatic Expansion Valves: Comply with ARI 750.
 1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: [40 deg F (4.4 deg C)].
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
 1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: Internal
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
 8. End Connections: Socket.
 9. Throttling Range: Maximum 5 psig (34 kPa).
 10. Working Pressure Rating: 500 psig (3450 kPa).
 11. Maximum Operating Temperature: 240 deg F (116 deg C).
- I. Straight-Type Strainers:
 1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 275 deg F (135 deg C).
- J. Angle-Type Strainers:
 1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig (3450 kPa).
 6. Maximum Operating Temperature: 275 deg F (135 deg C).
- K. Moisture/Liquid Indicators:

1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
- L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- N. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.03 REFRIGERANTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Atofina Chemicals, Inc.
 - 2. DuPont Company; Fluorochemicals Div.
 - 3. Honeywell, Inc.; Genetron Refrigerants.
 - 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR or L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 23 09 00 "Instrumentation and Control for HVAC" and Section 23 09 93 "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 31 13 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- R. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."

3.03 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.04 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer (on pipe sizes 1-1/2 inch and larger).
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze (on pipe sizes 1-1/2 inch and larger).
 - 4. Spring hangers to support vertical runs (on pipe sizes 1-1/2 inch and larger).
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).

3.05 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.06 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 - 4. Charge system with a new filter-dryer core in charging line.

3.07 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

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SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Related Sections include the following:
 - 1. Division 1 Section "LEED Requirements".
 - 2. Division 7 Sections "Joint Sealants" and "Firestopping" for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.
 - 3. Division 23 Section "Duct Insulation" for duct insulation.
 - 4. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.
 - 5. Division 23 Section "Diffusers, Registers, and Grilles."
 - 6. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air balancing and final adjusting of manual-volume dampers.

1.03 DEFINITIONS

- A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula $\text{Btu} \times \text{in.} / \text{h} \times \text{sq. ft.} \times \text{deg F}$ or $\text{W} / \text{m} \times \text{K}$ at the temperature differences specified. Values are expressed as Btu or W.
 - 1. Example: Apparent Thermal Conductivity (k-Value): 0.26 or 0.037.

1.04 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

1.05 SUBMITTALS

- A. Product Data: For duct liner and sealing materials.

- B. Shop Drawings: Show details of the following:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating pressure classifications and sizes on plans.
 - 3. Fittings.
 - 4. Reinforcement and spacing.
 - 5. Seam and joint construction.
 - 6. Penetrations through fire-rated and other partitions.
 - 7. Terminal unit, and coil, installations.
 - 8. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members.
 - 2. Other systems installed in same space as ducts.
 - 3. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
 - 4. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.
- D. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.06 QUALITY ASSURANCE

- A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.
- C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.
- C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards—Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 DUCT LINER

- A. General: Comply with NFPA 90A or NFPA 90B and NAIMA's "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers:
 - a. CertainTeed Corp.; Insulation Group.
 - b. Johns Manville International, Inc.
 - c. Knauf Fiber Glass GmbH.
- B. Materials: ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers.
 - 1. Thickness: 1 inch (inside).
 - 2. Thickness: 1-1/2 inches (outdoors).
 - 3. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - 4. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C 411.
 - 5. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C 916.

6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
 - a. Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
 - b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
 - c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.04 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
 1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.
 2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.
 3. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
 4. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.05 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
 2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards-- Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
 1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
 3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.06 RECTANGULAR DUCT FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
 - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 - 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness reinforcement size and spacing and joint reinforcement.
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Nexus, Inc.
 - c. Ward Industries, Inc.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards—Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Lockformer.
- D. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.
- E. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- F. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.07 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.
- B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
- G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

- H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - 1. Fan discharge.
 - 2. Intervals of lined duct preceding unlined duct.
 - 3. Upstream edges of transverse joints in ducts.
- I. Secure insulation liner with perforated sheet metal liner of same metal thickness as specified for duct, secured to ducts with mechanical fasteners that maintain metal liner distance from duct without compressing insulation.
 - 1. Sheet Metal Liner Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
- J. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.08 ROUND AND FLAT-OVAL DUCT FABRICATION

- A. General: Diameter as applied to flat-oval ducts in this Article is the diameter of the size of round duct that has a circumference equal to perimeter of a given size of flat-oval duct.
- B. Round Longitudinal- and Spiral Lock Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- C. Flat-Oval, Longitudinal- and Spiral Lock Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Fabricate ducts larger than 72-inches in diameter with butt-welded longitudinal seams.
 - 1. Manufacturers:
 - a. McGill AirFlow Corporation.
 - b. SEMCO Incorporated.

2.09 ROUND AND FLAT-OVAL DUCT FITTING FABRICATION

- A. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
- B. Ducts 21 to 72-inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
- C. Ducts Larger than 72-inches in Diameter: Companion angle flanges joints per SMACNA "HVAC Duct Construction Standards—Metal and Flexible," Figure 3-2.
- D. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
 - 1. Manufacturers:
 - a. Lindab Inc.
- E. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.
 - 1. Manufacturers:

- a. Ductmate Industries, Inc.
 - b. McGill AirFlow Corporation.
 - c. SEMCO Incorporated.
- F. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.
- G. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.
- H. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
 - 1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
 - 2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
 - a. Ducts 3 to 26 Inches in Diameter: 0.028 inch.
 - b. Ducts 27 to 36 Inches in Diameter: 0.034 inch.
 - c. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
 - d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
 - 3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
 - a. Ducts 3 to 14 Inches in Diameter: 0.028 inch.
 - b. Ducts 15 to 26 Inches in Diameter: 0.034 inch.
 - c. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
 - d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
 - 4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal seam flat-oval duct.
 - 5. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
 - 6. Round Elbows, 8 Inches and Smaller: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
 - 7. Round Elbows, 9 through 14 Inches: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.

8. Round Elbows, Larger Than 14 Inches, and All Flat-Oval Elbows: Fabricate gored elbows, unless space restrictions require a mitered elbow.
9. Die-Formed Elbows for Sizes through 8 Inches and All Pressures: 0.040 inch thick with two-piece welded construction.
10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
11. Flat-Oval Elbow Metal Thickness: Same as longitudinal seam flat-oval duct specified above.
12. Pleated Elbows for Sizes through 14 Inches and Pressures through 10-Inch wg: 0.022 inch.

PART 3 - EXECUTION

3.01 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 1. Supply Ducts (Positive Pressure): 2-inch wg.
 2. Return Ducts (Negative Pressure): 2-inch wg.
 3. Exhaust Ducts (Negative Pressure): 2-inch wg.
- B. All ducts shall be galvanized steel.

3.02 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards—Metal and Flexible," unless otherwise indicated.
- B. Install round and flat-oval ducts in lengths not less than 12 feet, unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct.
- F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

- M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Air Duct Accessories."
- N. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction".
- P. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified Division 9 painting Sections.

3.03 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Pressure Classification Less Than 2-Inch wg: Transverse joints.
- C. Seal externally insulated ducts before insulation installation.

3.04 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- E. Install concrete inserts before placing concrete.
- F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3.05 CONNECTIONS

- A. Connect equipment with flexible connectors according to Division 23 Section "Air Duct Accessories."
- B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.06 FIELD QUALITY CONTROL

- A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.
- B. Conduct tests, in presence of Engineer, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

- C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.
 - 1. Allowable Leakage, Supply Duct System: 2 percent of design airflow.
 - 2. Allowable Leakage, Exhaust Duct System: 2 percent of design airflow.
- D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.
- E. Remake leaking joints and retest until leakage is less than maximum allowable.
- F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.07 ADJUSTING

- A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.
- B. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for detailed procedures.

3.08 CLEANING

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
 - 1. Create other openings to comply with duct standards.
 - 2. Disconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
 2. Where contaminants are discovered, re-clean and re-inspect ducts.

END OF SECTION

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Fire smoke dampers.
 - 4. Turning vanes.
 - 5. Duct-mounted access doors and panels.
 - 6. Flexible ducts.
 - 7. Flexible connectors.
 - 8. Duct accessory hardware.
- B. Related Sections include the following:
 - 1. Division 1 Section for LEED Requirements.
 - 2. Division 8 Section for wall- and ceiling-mounted access doors and panels.
 - 3. Division 23 Section "Diffusers, Registers, and Grilles."
 - 4. Division 23 Section "Instrumentation and Controls for HVAC" for electric and pneumatic damper actuators.
 - 5. Division 26 Section for duct-mounted fire smoke detectors.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Fire smoke dampers.
 - 4. Duct-mounted access doors and panels.
 - 5. Flexible ducts.
 - 6. Turning vanes.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
 2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.
- D. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.04 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.05 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Extruded Aluminum: ASTM B 221, Alloy 6063, Temper T6.
- C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations.
- B. Frame: 0.052-inch- thick, galvanized, sheet steel, with welded corners and mounting flange.
- C. Blades: 0.050-inch- thick aluminum sheet.
- D. Blade Seals: Neoprene.
- E. Blade Axles: Galvanized steel.
- F. Tie Bars and Brackets: Galvanized steel.
- G. Return Spring: Adjustable tension.

2.03 MANUAL-VOLUME DAMPERS

- A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- B. Low-Leakage Volume Dampers: Multiple- or single-blade, opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized, sheet steel.
 3. Blade Seals: Neoprene.
 4. Blade Axles: Galvanized steel.
 5. Tie Bars and Brackets: Galvanized steel.
- C. Jackshaft: 1-inch- diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.
- D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04 FIRE SMOKE DAMPERS

- A. General: Labeled to UL 555S. Combination fire and smoke dampers shall be labeled for one-and-one-half-hour rating to UL 555.
- B. Fusible Link: Replaceable, 165 or 212 deg F rated as indicated.
- C. Frame and Blades: 0.064-inch- thick, galvanized, sheet steel.
- D. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized, sheet steel; length to suit wall or floor application.
- E. Damper Motors: Provide for two-position action.
 1. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 2. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 3. Outdoor Motors and Motors in Outside-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 4. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.

2.05 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

- B. Retain paragraph below for turning vanes fabricated by Installer; delete if not required.
- C. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.
- D. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.06 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
- B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.07 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet.
- C. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- D. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.
- E. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
 - 1. Minimum Weight: 26 oz./sq. yd..
- F. High-Corrosive-Environment System Flexible Connectors: Glass fabric coated with a chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd..
 - 2. Tensile Strength: 450 lbf/inch in the warp, and 340 lbf/inch in the filling.

2.08 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- thick, glass-fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in inner liner.

2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 3. Inner Liner: Polyethylene film.
- C. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.09 ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.
- B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire smoke dampers according to manufacturer's UL-approved written instructions.
- E. Install fusible links in fire smoke dampers.
- F. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
 2. Install access panels on side of duct where adequate clearance is available.
- G. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment."
- H. Install turning vanes in 90° rectangular elbows.

3.02 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION

SECTION 23 37 13
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
 - 1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
 - 2. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for balancing diffusers, registers, and grilles.

1.03 DEFINITIONS

- A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.
- C. Register: A combination grille and damper assembly over an air opening.

1.04 SUBMITTALS

- A. Product Data: For each model indicated, include the following:
 - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
 - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
 - 3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
 - 4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

- A. Diffusers, registers, and grilles are scheduled at the end of this Section.

2.02 SOURCE QUALITY CONTROL

- A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Engineer for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.03 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.04 CLEANING

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

3.05 DIFFUSER, REGISTER AND GRILLE SCHEDULE

A. Lay in Ceiling Diffuser:

1. Products: Subject to compliance with requirements, modular removable core, 4 core, provide one of the following:
 - a. Air Systems Components; Krueger Div.
 - b. Anemostat Products; Dynamics Corp. of America.
 - c. Titus.
 - d. Price.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Duct Connection: Round. or Square.
5. Duct Connection Size: As shown on drawings.
6. Face Size: 24" x 24."
7. Maximum Noise-Criterion Rating: NC20.
8. Face Style: Square. Perforated.
9. Mounting: Lay in.
10. Pattern: Adjustable.
11. Dampers: Opposed blade.

B. Hard Ceiling or Duct Mount Diffusers: Is the same as lay in ceiling diffusers except:

1. Face Size: Frame size required for duct connection size.
2. Face Style: Square.
3. Mounting: Surface mount.
4. Accessories: Provide fames style to match mounting style.

C. Sidewall Supply Register:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Air Systems Components; Krueger Div.
 - b. Anemostat Products; Dynamics Corp. of America.
 - c. Titus.
 - d. Price.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Adjustable vertical.
5. Delete subparagraph below if no rear blades.
6. Rear Blade Arrangement: Adjustable horizontal.
7. Frame: 1 inch wide.
8. Mounting: Concealed.
9. Damper Type: Adjustable opposed-blade assembly.

10. Accessories: Provide frame style to match mounting surface.
- D. Sidewall/Hard Ceiling: Return or Exhaust register is the same as sidewall supply register except square or rectangular face style and fixed horizontal single face blade.
- E. Lay-in ceiling return or exhaust register is same as lay in ceiling diffuser except without adjustable pattern and removable core.

END OF SECTION

SECTION 23 81 26
SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.
- B. Related Sections include the following:
 - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."

1.02 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Units shall be designed to operate with HCFC-free refrigerants.

1.04 COORDINATION

- A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion on compressors and coils, and one year on parts.

1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carrier Air Conditioning; Div. of Carrier Corporation.
 2. Trane Company (The); Unitary Products Group.
 3. York International Corp.

2.02 EXPOSED EVAPORATOR-FAN COMPONENTS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 1. Insulation: Faced, glass-fiber duct liner.
 2. Drain Pans: Galvanized steel, with connection for drain; insulated.
 3. Ductless unit with finished enclosure exposed in room, adjustable deflection supply grille, return grille and wall mount or suspended support brackets.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- D. Fan Motors: Comply with requirements in 23 Section "Common Motor Requirements for HVAC Equipment."
 1. Special Motor Features: Multi-tapped, variable speed with internal thermal protection and permanent lubrication.
- E. Disposable Filters: 1 inch thick, in fiberboard frames.
- F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 Concealed Evaporator-Fan Components:

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
- B. Insulation: Faced, glass-fiber duct liner.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
- D. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.

- E. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
- F. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- G. Fan Motors:
 - 1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
 - 2. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - 3. Three-phase, permanently lubricated, ball-bearing motors with built-in thermal-overload protection.
 - 4. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. ASHRAE compliance in "Airstream Surfaces" Subparagraph below may be required to comply with Project requirements or authorities having jurisdiction. Retain first subparagraph to comply with LEED Prerequisite IEQ 1.
- I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- J. Filters: Permanent, cleanable.
- K. Condensate Drain Pans: Provide factory supplied drainable condensate drain pan with connection at lowest point of pan.

2.04 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Scroll.
 - 2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - 3. Refrigerant Charge: R-410a.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
- D. Fan: Aluminum-propeller type, directly connected to motor.
- E. Motor: Permanently lubricated, with integral thermal-overload protection.
- F. Low Ambient Kit: Permits operation below 45 deg F.

2.05 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install seismic restraints.
- E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- F. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 26.
- D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.04 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION

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SECTION 26 01 00
ELECTRICAL GENERAL PROVISIONS

ARTICLE 1 SUMMARY

- 1.1 This Division of the specification outlines the provisions of the contract work to be performed under this Division.
- 1.2 This Section applies to and forms a part of each section of specifications in Division 26 and all work performed under Division 26, 27 and 28.
- 1.3 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under general requirements.
- 1.4 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.
- 1.5 Where the words 'provide' or 'provision' are used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.
- 1.6 Where items are specified in the singular, this Division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

ARTICLE 2 CONTRACTOR QUALIFICATIONS

- 2.1 The Contractor shall have a current California C-10 Electrical Contractor's license and all individuals working on this project shall have passed the Department of Industrial Relations Division of apprenticeship Standards – "Electrician Certification Program."

ARTICLE 3 CODES, PERMITS AND FEES

- 3.1 Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of NFPA and serving utility requirements.
- 3.2 Obtain permits, fees, inspections, meter and the like, associated with work in each section of this Division.
- 3.3 Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

ARTICLE 4 EXAMINATION OF PREMISES

- 4.1 Examine the construction drawings and premises prior to bidding. No allowances will be made for not being knowledgeable of existing conditions.

ARTICLE 5 STANDARDS

- 5.1 The following standard publications of the latest editions enforced, and supplements thereto shall form a part of these specifications. All electrical work must, as a minimum, be in accordance with these standards.
- 5.1.1 2019 California Electrical Code (CEC), Part 3 Title 24 CCR.
 - 5.1.2 National Fire Protection Association.
 - 5.1.3 Underwriters' Laboratories, Inc. (UL).
 - 5.1.4 Certified Ballast Manufacturers' Association (CBM).
 - 5.1.5 National Electrical Manufacturers' Association (NEMA).
 - 5.1.6 Institution of Electrical & Electronics Engineers (IEEE).
 - 5.1.7 American Society for Testing & Materials (ASTM).
 - 5.1.8 National Board of Fire Underwriters (NBFU).
 - 5.1.9 National Board of Standards (NBS).
 - 5.1.10 American National Standards Institute (ANSI).
 - 5.1.11 Insulated Power Cable Engineers Association (IPECS).
 - 5.1.12 Electrical Testing Laboratories (ETL).
 - 5.1.13 National Electrical Safety Code (NESC).
 - 5.1.14 2019 California Building Code (CBC), Part 2, Title 24 CCR.
 - 5.1.15 2019 California Fire Code (CFC), Part 9, Title 24, CCR.
 - 5.1.16 2016 NFPA 72 with California State Amendments
 - 5.1.17 National Electrical Testing Association (NETA), 2010 or most current

ARTICLE 6 DEFINITIONS

- 6.1 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.
- 6.2 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.
- 6.3 Finish Space: Any space ordinarily visible, including exterior areas.

ARTICLE 7 WORK AND MATERIALS

- 7.1 Unless otherwise specified, all materials must be new and of the best quality. Materials previously incorporated into other projects, salvaged, or refurbished are not considered new. Perform all labor in a thorough and workmanlike manner.
- 7.2 All materials provided under the contract must bear the UL label where normally available. Note that this requirement may be repeated under equipment specifications. In general, such devices as will void the label should be provided in separate enclosures and wired to the labeled unit in proper manner.

ARTICLE 8 SHOP DRAWINGS AND SUBMITTALS

- 8.1 Submit shop drawings and all data in accordance with Division 1 of these specifications and as noted below for all equipment provided under this Division.
- 8.2 Shop drawings submittals demonstrate to the Architect that the Contractor understands the design concept. The Contractor demonstrates their understanding by indicating which equipment and material they intend to furnish and install and by detailing the fabrication and installation methods of material and equipment he intends to use. If deviations, discrepancies, or conflicts between submittals and specifications are discovered either prior to or after submittals are processed, notify the Architect immediately.
- 8.3 Manufacturer's data and dimension sheets shall be submitted giving all pertinent physical and engineering data including weights, cross sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.
- 8.4 Index all submittals and reference them to these specifications. All submittal items shall be assembled and submitted, one for each specification section. (Multiple specification sections may be grouped together in one common submittal binder, as long as each individual section is clearly identified.) Partial or incomplete submittal sections will not be reviewed.

ARTICLE 9 EQUIPMENT PURCHASES

- 9.1 Arrange for purchase and delivery of all materials and equipment within 20 days after approval of submittals. All materials and equipment must be ordered in ample quantities for delivery at the proper time. If items are not on the project in time to expedite completion, the Owner may purchase said equipment and materials and deduct the cost from the contract sum.
- 9.2 Provide all materials of similar class or service by one manufacturer.

ARTICLE 10 COOPERATIVE WORK

- 10.1 Correct without charge any work requiring alteration due to lack of proper supervision or failure to make proper provision in time. Correct without charge any damage to adjacent work caused by the alteration.
- 10.2 Cooperative work includes: General supervision and responsibility for proper location and size of work related to this Division, but provided under the other sections of these specifications, and installation of sleeves, inserts, and anchor bolts for work under each section in this Division.

ARTICLE 11 VERIFICATION OF DIMENSIONS

- 11.1 Scaled and figured dimensions are approximate only. Before proceeding with work, carefully check and verify dimensions, etc., and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.
- 11.2 Drawings are essentially diagrammatic, and many offsets, bends, pull boxes, special fittings, and exact locations are not indicated. Carefully study drawings and premises in order to determine best methods, exact location, routes, building obstructions, etc. and install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, keep openings and passageways clear, and maintain proper clearances.

ARTICLE 12 CLOSING-IN OF UNINSPECTED WORK

- 12.1 Cover no work until inspected, tested, and approved by the Architect. Where work is covered before inspection and test, uncover it and when inspected, tested, and approved, restore all work to original proper condition at no additional cost to Owner.

ARTICLE 13 EXCAVATION AND BACKFILL

- 13.1 All excavation and backfill shall be in accordance with Division 1 of these specifications and as noted below.
- 13.2 Perform all necessary excavation, shoring, and backfilling required for the proper laying of all conduits inside the building and premises, and outside as may be necessary.
- 13.3 Excavate all trenches open cut, keep trench banks as nearly vertical as practicable, and sheet and brace trenches where required for stability and safety. Excavate trenches true to line and make bottoms no wider than necessary to provide ample work room. Grade trench bottoms accurately. Machine grade only to the top line of the conduits, doing the remainder by hand. Do not cut any trench near or under footings without first consulting the Architect. All trenches shall be done in accordance with OSHA standards and regulations.
- 13.4 Backfilling shall be done with each layer compacted before another layer is added. No stones or coarse lumps shall be laid directly on a conduit or conduits.

- 13.5 Trenches shall be filled with the specified material. Sod, if any, shall be removed in cut sections and replaced in same manners.
- 13.6 Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.
- 13.7 Perform all backfilling in accordance with the requirements of and under the direction of the Geotechnical Engineer.
- 13.8 Where new underground trenching is required on sites or in any area where existing underground utilities exist, the Contractor shall provide an independent professional utility locating service to locate exact vertical and horizontal locations of all existing utilities. Where existing utilities are found the Contractor shall hand dig those areas to avoid disruption. The Contractor shall be responsible for immediate repairs to existing underground utilities damaged during construction. The Contractor shall repair all existing asphalt, concrete and landscape surfaces damaged or removed during construction to match their original conditions. Where trenching extends through public streets or roadways, the Contractor shall notify underground service alert in addition to the independent locating service 48 hours before start of construction to determine location of existing utilities by calling (800) 422-4133.

ARTICLE 14 CONCRETE

- 14.1 Where used for structures to be provided under the contract such as bases, etc., concrete work, and associated reinforcing shall be as specified under Division 3 of these specifications.
- 14.2 See other sections for additional requirements for underground vaults, cable ducts, etc.

ARTICLE 15 ACCESSIBILITY

- 15.1 Install all control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement conveniently and accessibly throughout the finished building.
- 15.2 All required access doors or panels in walls and ceilings are to be furnished and installed as part of the work under this Section. Refer to Division 1 of these specifications and as noted below.
- 15.3 Where located in fire rated assemblies, provide doors which match the rating of the assembly and are approved by the jurisdictional authority.
- 15.4 Refer to 'finish schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.
- 15.5 Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

ARTICLE 16 FLASHING

- 16.1 Flash and counter flash all conduits penetrating roofing membrane as shown on Architectural drawings. All work shall be in accordance with Division 7 of these specifications.

ARTICLE 17 IDENTIFICATION OF EQUIPMENT

- 17.1 All electrical equipment shall be labeled, tagged, stamped, or otherwise identified in accordance with the following schedules:

17.1.1 General:

- 17.1.1.1 In general, the installed laminated nameplates as hereinafter called for shall also clearly indicate its use, areas served, circuit identification, voltage and any other useful data.
- 17.1.1.2 All auxiliary systems, including communications, shall be labeled to indicate function.

17.1.2 Lighting and Local Panelboards:

- 17.1.2.1 Panel identification shall be with white and black micarta nameplates. Letters shall be no less than 3/8" high.
- 17.1.2.2 Circuit directory shall be two column typewritten card set under glass or glass equivalent. Each circuit shall be identified by the room number and/or number of unit and other pertinent data as required.

17.1.3 Distribution Switchboards and Feeders Sections:

- 17.1.3.1 Identification shall be with 1" x 4" laminated white micarta nameplates with black lettering on each major component, each with name and/or number of unit and other pertinent data as required. Letters shall be no less than 3/8" high.
- 17.1.3.2 Circuit breakers and switches shall be identified by number and name with 3/8" x 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to or on circuit breaker or switch.

17.1.4 Disconnect Switches, Motor Starters and Transformers:

- 17.1.4.1 Identification shall be with white micarta laminated labels and 3/8" high black lettering.

- 17.1.5 All communication system terminal boxes including T.V., telephone/intercom, security, fire alarm, clock, and computer networking shall be provided with white micarta laminated labels and 3/8" high black lettering.

ARTICLE 18 CONSTRUCTION FACILITIES

- 18.1 Furnish and maintain from the beginning to the completion all lawful and necessary guards, railings, fences, canopies, lights, warning signs, etc. Take all necessary precautions required by City, State Laws, and OSHA to avoid injury or damage to any persons and property.
- 18.2 Temporary power and lighting for construction purposes shall be provided under this Section. All work shall be in accordance with Division 1 of these specifications.

ARTICLE 19 GUARANTEE

- 19.1 Guarantee all material, equipment and workmanship for all sections under this Division in writing to be free from defect of material and workmanship for one year from date of final acceptance, as outlined in the general conditions. Replace without charge any material or equipment proven defective during this period. The guarantee shall include performance of equipment under all site conditions, conditions of load, installing any additional items of control and/or protective devices, as required.

ARTICLE 20 PATENTS

- 20.1 Refer to the General Conditions for Contractor's responsibilities regarding patents.

ARTICLE 21 PLUMBING (DIVISION 22) / HEATING, VENTILATING, AND AIR CONDITIONING (DIVISION 23) / ELECTRICAL – COORDINATION REQUIREMENTS

- 21.1 All electrical work performed for this project shall conform to the California Electrical Code, to Local Building Codes and in conformance with Division 22, 23, and 26 of these specifications, whether the work is provided under the "Plumbing", "Heating, Ventilating, and Air Conditioning", or the "Electrical" Division of these specifications. Where the Division 22 and/or Division 23 Contractor is required to provide electrical work, he shall arrange for the work to be done by a licensed Division 26 Contractor, using qualified electricians. The Division 22 and/or Division 23 Contractor shall be solely and completely responsible for the correct functioning of all equipment regardless of who provided the electrical work.
- 21.2 The work under Division 22 and/or Division 23 shall include the following:
- 21.2.1 All motors required by mechanical equipment.
- 21.2.2 All starters for mechanical equipment which are not provided under the electrical division as part of a motor control center or otherwise indicated on the electrical drawings.

- 21.2.3 All wiring interior to packaged equipment furnished as an integral part of the equipment.
- 21.2.4 All control **wiring and conduit** for mechanical control systems.
- 21.2.5 All control systems required by mechanical equipment.
- 21.3 The work under Division 26 shall include the following:
 - 21.3.1 All power wiring and conduit; and conduit only for EMS control conductors between each building and the main control panel.
 - 21.3.2 Electrical disconnects as shown on the electrical drawings.
 - 21.3.3 Starters forming part of a motor control center.
- 21.4 All power wiring and conduit to equipment furnished under Division 22 and/or Division 23 shall be provided under Division 26. Control wiring and conduit, whether line voltage or low voltage, shall be provided under the division which furnishes the equipment.
- 21.5 Power wiring shall be defined as all wiring between the panelboard switchboard overcurrent device, motor control center starter or switch, and the safety disconnect switch or control panel serving the equipment. Also, the power wiring between safety disconnect switch and the equipment line terminals.
- 21.6 Control wiring shall be defined as all wiring, either line voltage or low voltage, required for the control and interlocking of equipment, including but not limited to wiring to motor control stations, solenoid valves, pressure switches, limit switches, flow switches, thermostats, humidistats, safety devices, smoke detectors, and other components required for the proper operation of the equipment.
- 21.7 All motor starters which are not part of motor control centers and which are required for equipment furnished under this Division shall be furnished and installed by the Division furnishing the equipment and power wiring connected under Division 26. Motor starters and control devices in motor control centers shall be furnished and installed under Division 26.
- 21.8 Division 26 Contractor shall make all final connections of power wiring to equipment furnished under this Division.
- 21.9 Wiring diagrams complete with all connection details shall be furnished under each respective Section.
- 21.10 Motor starters supplied by Plumbing and/or Heating, Ventilating and Air Conditioning shall be fused combination type minimum NEMA Size 1, and conform to appropriate NEMA standards for the service required. Provide NEMA type 3R/12 gasketed

enclosures in wet locations. Provide all starters with appropriately sized overload protection and heater strips provided in each phase, hand/off auto switches, a minimum of 2 NO and NC auxiliary contacts as required, and an integral disconnecting means. For ½ horsepower motors and below, when control requirements do not dictate the use of a starter, a manual motor starter switch with overload protection in each phase may be provided. Acceptable manufacturers are Allen Bradley, General Electric, Square D, Furnas and Cutler Hammer.

ARTICLE 22 EQUIPMENT ROUGH-IN

- 22.1 Rough-in all equipment, fixtures, etc. as designed on the drawings and as specified herein. The drawings indicate only the approximate location of rough-ins. Mounting heights of all switches, receptacles, wall mounted fixtures and such equipment must be coordinated with the Architectural Designs. The Contractor shall obtain all rough-in information before progressing with any work for rough-in connections. Minor changes in the contract drawings shall be anticipated and provided for under this Division of the specifications to comply with rough-in requirements.

ARTICLE 23 OWNER FURNISHED AND OTHER EQUIPMENT

- 23.1 Rough-in and make final connections to all Owner furnished equipment shown on the drawings and specified, and all equipment furnished under other sections of the specifications.

ARTICLE 24 EQUIPMENT FINAL CONNECTIONS

- 24.1 Provide all final connections for the following:
 - 24.1.1 All equipment furnished under this Division.
 - 24.1.2 Electrical equipment furnished under other sections of the specification.
 - 24.1.3 Owner furnished equipment as specified under this Division.

ARTICLE 25 INSERTS, ANCHORS, AND MOUNTING SLEEVES

- 25.1 Inserts and anchors must be:
 - 25.1.1 Furnished and installed for support of work under this Division.
 - 25.1.2 Mounting of equipment that is of such size as to be free standing and that equipment which cannot conveniently be located on walls, such as motor starters, etc., shall be rigidly supported on a framework of galvanized steel angle of Unistrut or B-line systems with all unfinished edges painted.
 - 25.1.3 Furnish and install all sleeves as required for the installation of all work under all Sections of this Division and for all communication systems including any

communication systems described in this Section which are bid to the General Contractor. Sleeves through floors, roof, and walls shall be as described in "Conduit and Fittings" Section 26 05 33.

ARTICLE 26 SEISMIC ANCHORING

- 26.1 All switchgear and other free-standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment to the structure. The Contractor shall submit drawings signed by the Contractors registered structural Engineer indicating method of compliance prior installation.
- 26.2 All sound systems, communication, signal or data networking equipment or enclosures shall be anchored to the structure. The Contractor shall submit drawings signed by the Contractors registered Structural Engineer indicating method of compliance prior to installation.

ARTICLE 27 RUST PROOFING

- 27.1 Rust proofing must be applied to all ferrous metals and shall be in accordance with Section 05500 of these specifications and as noted below.
 - 27.1.1 Hot-dipped galvanized shall be applied and after forming of angle-iron, bolts, anchors, etc.
 - 27.1.2 Hot-dipped galvanized coating shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

ARTICLE 28 GENERAL WIRING

- 28.1 Where located adjacent in walls, outlet boxes shall not be placed back to back, nor shall extension rings be used in place of double boxes, all to limit sound transmission between rooms. Provide short horizontal nipple between adjacent outlet boxes, which shall have depth sufficient to maintain wall coverage in rear by masonry wall.
- 28.2 In those instances where outlet boxes, recessed terminal boxes, or recessed equipment enclosures are installed in a fire rated assembly, provide "Flamesafe FSD 1077" fire stopping pads or approved equal, over the outlet or box.
- 28.3 Complete rough-in requirements of all equipment to be wired under the contract are not indicated. Coordinate with respective trades furnishing equipment or with the Architect as the case may be for complete and accurate requirements to result in a neat, workmanlike installation.

ARTICLE 29 SEPARATE CONDUIT SYSTEMS

- 29.1 Each electrical and signal system shall be contained in a separate conduit system as shown on the drawings and as specified herein. This includes each power system, each

lighting system, each signal system of whatever nature, telephone, standby system, sound system, control system, fire alarm system, etc.

- 29.2 Further, each item of building equipment must have its own run of power wiring. Control wiring may be included in properly sized conduit for equipment feeders of #6 AWG and smaller, having separate conduit for larger sizes.

ARTICLE 30 CLEANUP

- 30.1 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.
- 30.2 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.
- 30.3 During the progress of the work, keep the premises clean and free of debris.

ARTICLE 31 UTILITY SERVICES

- 31.1 The Division 26 Contractor shall contact the serving utility companies; notify the serving power, telephone and cable TV utilities of the following:
- 31.1.1 Name and address of Contractor.
- 31.1.2 Estimated times of construction start, completion and required service connections.
- 31.1.3 Project service voltage, phase load, and service size.
- 31.1.4 Provide to the Architect written verification from each utility company indicating their concurrence with the contract documents.
- 31.2 Contractor shall notify underground service alert 48 hours before start of construction to determine location of existing utilities by calling (800) 422-4133. All work shall be in accordance with the Division 1 Sections of these specifications.
- 31.3 All utility company requirements shall be complied with and approval shall be obtained from the utility company for service equipment. Such as, verification of a field test of the ground fault protection on the main service equipment, panic hardware and etc.

ARTICLE 32 TEST AND INSPECTION PROCEDURES – EXISTING MEDIUM VOLTAGE, AIR INSULATED, CIRCUIT BREAKER TESTS

- 32.1 Tests shall be done in accordance with ANSI/NETA Standards and by a contractor certified in medium voltage testing and procedures. Contractor qualifications shall be submitted to the electrical engineer of record for approval.
- 32.2 Testing shall not be done or scheduled until the outage is scheduled and approved by the owner. Outage shall not exceed 24 hours unless approved by the owner and coordinated with the CM and Architect of Record.
- 32.3 Visual and Mechanical Inspection
 - 32.3.1 Inspect physical and mechanical condition.
 - 32.3.2 Inspect anchorage, alignment, and grounding.
 - 32.3.3 Verify that all maintenance devices are available for servicing and operating the breaker.
 - 32.3.4 Clean the Unit.
 - 32.3.5 Inspect arc chutes.
 - 32.3.6 Inspect moving and stationary contacts for condition, wear, and alignment.
 - 32.3.7 Close/open breaker and check for binding, friction, contact alignment, contact sequence, and penetration.
 - 32.3.8 Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.
 - 32.3.9 Inspect bolted electrical connections for high resistance using one of the following methods:
 - 32.3.9.1 Use of a low-resistance ohmmeter in accordance with Section 33.4.
 - 32.3.9.2 Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
 - 32.3.9.3 Perform a thermographic survey in accordance with NETA standards.
 - 32.3.10 Verify cell fit and element alignment.
 - 32.3.11 Verify racking mechanism operation.
 - 32.3.12 Inspect puffer operation.
 - 32.3.13 Use appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

32.3.14 Record as-found and as-left operation-counter readings.

32.4 Electrical Tests

32.4.1 Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable. See Section 26 90 90

32.4.2 Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with the circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data.

32.4.3 Perform a contact/pole-resistance test.

32.4.4 With the breaker in a test position, perform the following tests:

32.4.4.1 Trip and close breaker with the control switch.

32.4.4.2 Trip breaker by operating each of its protective relays. Recalibrate and adjust relay settings based on time current study to be done for the project.

32.4.4.3 Verify mechanism charge, trip-free, and antipump functions.

32.4.4.4 Verify blowout coil circuit continuity.

32.4.4.5 Verify operation of heaters, if applicable.

32.4.4.6 Test instrument transformers in accordance with NETA standards.

32.5 Test Values

32.5.1 Test Values – Visual and Mechanical

32.5.1.1 Bolt-torque levels should be in accordance with manufacturer's published data.

32.5.1.2 Results of the thermographic survey shall be in accordance with NETA standards.

32.5.1.3 Compare travel and velocity values to manufacturer's published data.

32.5.2 Test Values – Electrical

32.5.2.1 Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.

- 32.5.2.2 Circuit breaker insulation resistance should be in accordance with manufacturer's published standards.
- 32.5.2.3 Insulation-resistance values of circuit breakers should be in accordance with manufacturer's published data. Values of insulation resistance less than manufacturer's recommendations should be investigated.
- 32.5.2.4 Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.
- 32.5.2.5 Breaker mechanism charge, close, open, trip, trip-free, and antipump features shall function as designed.
- 32.5.2.6 Minimum pickup for trip and close coils shall be in accordance with manufacturer's published data.
- 32.5.2.7 Power-factor or dissipation-factor and capacitance values should be within ten percent of nameplate rating for bushings. Hot collar tests are evaluated on a milliampere/milliwatt loss basis, and the results should be compared to values of similar bushings.
- 32.5.2.8 If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the over potential test, the circuit breaker is considered to have passed the test.
- 32.5.2.9 The blowout coil circuit should exhibit continuity.
- 32.5.2.10 Heaters should be operational.
- 32.5.2.11 The results of instrument transformer tests shall be in accordance with manufacturer's standards.

ARTICLE 33 PAINTING

- 33.1 Paint all unfinished metal as required in accordance with Division 1 of these specifications. (Galvanized and factory painted equipment shall be considered as having a sub-base finish.)

ARTICLE 34 GENERAL DEMOLITION REQUIREMENTS

- 34.1 Remove existing work and items which are required to be removed in such manner that minimum damage and disturbance is caused to adjacent and connection work scheduled to remain. Repair or replace existing work schedule.

- 34.2 Include preparation of existing areas to receive new materials and removal of materials and equipment to alter or repair the existing building as indicated and as specified.
- 34.3 Perform demolition exercising proper care to prevent injury to the public, workmen and adjoining property.
- 34.4 Perform the removal, cutting, drilling of existing work with extreme care and use small tools in order not to jeopardize the structural integrity of the building.
- 34.5 Rebuild to existing condition or better, existing work which has to be removed to allow the installation of new work as required.
- 34.6 Remove, protect and reinstall existing items as indicated. Replace materials scheduled for reuse which are damaged by the Contractor to the extent that they cannot be reused, with equal quality material, and installation.
- 34.7 Do not reuse in this project materials and items removed from existing site or building, except with specific written approval by the Architect in each case, unless such removed material or item is specifically indicated or specified to be reused.
- 34.8 Remove materials and equipment indicated to be salvaged for reinstallation and store to prevent damage and reinstall as the work progresses. Do not reuse in this project, other materials and equipment removed from existing site or building, except with specific written approval by the Architect in each case.
- 34.9 Patch areas requiring patching, including damage caused by removing, relocating or adding fixtures and equipment, damages caused by demolition at adjacent materials.
- 34.10 Do not stockpile debris in the existing building, without the approval of the Architect. Remove debris as it accumulates from removal operations to a legal disposal area.
- 34.11 Contractor to assume existing oil filled and dry transformers, oil switches, ballasts, lamps, wooden poles, cross arms, computers, computer monitors, and conductor insulation containing materials considered hazardous. Comply with local, state and federal regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Contractor shall be responsible for removal of the above hazardous materials where encountered. Include all costs for such removal as part of this contract.
- 34.12 All fluorescent, compact fluorescent, high intensity discharge, metal halide, mercury vapor, high and low-pressure sodium, and neon lamps are to be disposed of as required by the California Waste Rule Regulations as described in the California Code of Regulations, Title 22, Division 4.5 and Chapter 23.
- 34.13 **Communication System:** Where new communication systems, (including telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) are installed to replace existing systems, unless where otherwise directed the existing

systems shall remain fully operational until the new system has been installed and tested. Demolition of the existing systems shall include removal of all equipment and associated wiring and exposed conduits and providing new blank covers for all abandoned device locations.

- 34.14 **Salvage Power Equipment:** The Contractor shall carefully remove all existing switchboards, panelboards, transformers, and confirm in writing which items the Owner wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.
- 34.15 **Salvage Lighting Equipment:** The Contractor shall confirm in writing which items the Owner wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.
- 34.16 **Salvage Communication Equipment:** The Contractor shall carefully remove all communication devices (telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) and box each type of devices separately. The Contractor shall deliver all items to the Owner's maintenance facility.

ARTICLE 35 PROJECT CLOSEOUT

- 35.1 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this Division, in accordance with Division 1 of these specifications and as described below.
- 35.2 Equipment Lists and Maintenance Manuals:
 - 35.2.1 Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this Section of the specifications:
 - 35.2.1.1 Name, model, and manufacturer.
 - 35.2.1.2 Complete parts drawings and lists.
 - 35.2.1.3 Local supply for parts and replacement and telephone number.
 - 35.2.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.
- 35.3 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and

maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subcontractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

ARTICLE 36 RECORD DRAWINGS

- 36.1 The Division 26 Contractor shall maintain record drawings as specified in accordance with Division 1 of these specifications, and as noted below.
- 36.2 Drawings shall show locations of all concealed underground conduit runs, giving the number and size of conduit and wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with referencing CORs and RFIs, the drawings shall reflect all of the actual additions or changes made. All as-built drawing information shall be prepared by the contractor in AutoCAD, updating the contract computer files as needed to reflect actual installed conditions for all site plans, lighting, power, communication, networking, audio visual, security or fire alarms systems included in the scope of work for this project.
- 36.3 One set of these record drawings shall be delivered to the Architect. The engineer will review documents for completeness and will not be responsible for editing contractor computer files.

ARTICLE 37 CHANGES AND EXTRA WORK

- 37.1 When **changes** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:
 - 37.1.1 The material Costs shall **not exceed** the latest edition of the "Trade Service" end column "C" price list. The materials prices may be higher only where the Contractor can produce invoices to substantiate higher material costs. The Contractor shall submit a print out copy of the trade service sheets with the change order to substantiate these values.
 - 37.1.2 The labor Costs shall **not exceed** the latest edition of the "NECA Manual of Labor Units" **normal column**.
- 37.2 When **credits** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:
 - 37.2.1 The Material Costs shall **not be less than 80% of** the latest edition of the "Trade Service" end column price list. The materials prices may be lower only where

the Contractor can produce invoices to substantiate lower material costs. Restocking fees may also be included in this amount where applicable.

37.2.2 The Labor Costs shall **not be less than 80% of** the latest edition of the "NECA Manual of Labor Units" **normal column**.

37.3 Conduit pricing for conduits of all types sized 3" or smaller.

When changes in the scope of work require the Contractor to estimate conduit Installations, they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for conduit installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

37.3.1 Couplings.

37.3.2 Set Screw or Compression Fittings, locknuts, Bushings and washers.

37.3.3 Conduit straps and associated screws or nails.

37.3.4 LB fittings or other specialty fittings or specialty mounting hardware may be included where needed.

37.4 Wire pricing for all types and sizes.

When changes in the scope of work require the Contractor to estimate wire installations, they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for wire installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

37.4.1 Locknuts, Bushings, tape, wire markers.

37.5 When changes in the scope of work require other equipment installations such as lighting fixtures, panelboards, switchboards, wiring devices, communications equipment etc. the Contractor shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for these equipment items represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

37.5.1 Associated screws, nails, bolts, anchors or supports.

37.5.2 Locknuts, washers, tape.

37.6 The total labor hours for extra work will be required to be calculated as follows:

37.6.1 Change orders with 1 to 30 total labor hours

General Laborer	10%	of total labor hours
Journeyman	10%	of total labor hours
Foreman	80%	of total labor hours

37.6.2 Change orders with 31 to 100 total labor hours

General Laborer	20%	of total labor hours
Journeyman	40%	of total labor hours
Foreman	40%	of total labor hours

37.6.3 Change orders with over 100 total labor hours

General Laborer	30%	of total labor hours
Journeyman	50%	of total labor hours
Foreman	20%	of total labor hours

37.7 When change orders are issued which allow the work to be completed in the normal sequence of construction, the labor rates shall be based on the most current "Prevailing Wage" – straight time total hourly rate. When change orders require the Contractor to work out of sequence the "Prevailing Wage"– daily overtime hourly rate shall apply. Special condition situations shall be reviewed on an individual basis for alternate hourly rate schedules.

37.8 Costs **will not** be permitted for additional supervision on site or office time for processing any change order other than the 10% overhead allowance as described in Division 1. Cost for special equipment required to install items for an individual change order are permitted and must be individually identified. Lump Sum cost for small tools or any other cost not specifically required for the change order are **not** permitted.

37.9 Contractor estimates shall be formatted to clearly identify each of the following:

37.9.1 Line item description of each type of material or labor item.

37.9.2 Description of quantity for each item.

37.9.3 Description of (material cost per / quantity).

37.9.4 Description of (labor cost per / quantity).

37.9.5 Description of total labor hour breakdown per Foreman, Journeyman or General Laborer as described above.

ARTICLE 38 ELECTRONIC FILES

- 38.1 The Contractor shall make a **written** request directly to Johnson Consulting Engineers for electronic drawing files. As a part of the written request, please include the following information:
- 38.1.1 Clearly indicate each drawing sheet needed (i.e., E1.1, E2.1, etc.).
- 38.1.2 Identify the name, phone number, mailing address and e-mail address of the person to receive the files.
- 38.1.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.
- 38.2 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, **will not be made available to the Contractor.**
- 38.3 Files will only be provided in the AutoCAD format in which they were created.
- 38.4 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use.
- 38.5 CAD files will be made available via e-mail or on disk, depending on the quantity of files requested. The Contractor requesting the files will be required to pay \$50.00 per drawing plan, or \$300.00 maximum, whichever is **less**.

END OF SECTION

SECTION 26 05 19
POWER CONDUCTORS

PART 1 – GENERAL

- 1.1 Furnish and install wire and cable for branch circuits and feeders specified herein and as shown on the electrical drawings.
- 1.2 Submittals: Submit manufacturers' data for the following items:
 - 1.2.1 All cables and terminations
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not including all items listed in the above itemized description.
 - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining, or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed

PART 2 – PRODUCTS

- 2.1 Wire and cable Rated 120 volt to 600 volt.
 - 2.1.1 All wire and cable shall be new, 600 volt insulated copper, of types specified below for each application. All wire and cable shall bear the UL label and shall be brought to the job in unbroken packages. Wire insulation shall be the color as specified herein and shall be type THWN-2. Insulated conductors shall be installed in all exterior exposed raceways. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems shall be a minimum of No. 12 AWG. Increase conductor size to No. 10 AWG for 120 volt circuits greater than 100 feet from the panel to the load and for 277 volt circuits greater than 200 feet from the panel to the load. Circuit home-runs indicated to be larger than No. 12 must be increased the entire length of the circuit, including equipment grounding conductor. Wire sizes No. 14 through No. 10 shall be solid. No. 8 and larger shall be stranded.
 - 2.1.2 Aluminum conductors will be permitted (only where specifically identified on the drawings. See "600 Volt Feeder Schedule") in sizes 2/0 or larger. Conductors shall be listed by Underwriters Laboratories (UL) and suitable for operation at 600 volts or less, at a maximum operating temperature of 90N C

maximum in wet or dry locations. Conductors shall be marked "SUN-RES". Aluminum alloy conductors shall be compact stranded conductors of STABILOY® (AA-8030) as manufactured by Alcan Cable or Listed equal. AA-8000 Series aluminum alloy conductor material shall be recognized by The Aluminum Association.

2.1.3 MC type armored cable reference Section 26 05 33.

2.2 Wire and cable for systems below 120 volts.

2.2.1 All low voltage and communications systems cables routed underground shall be provided with a moisture resistant outer jacket, West Penn "Aquaseal" or equal, unless otherwise specified.

PART 3 - EXECUTION

3.1 Wire and cable shall be pulled into conduits without strain using powdered soapstone, mineralac, or other approved lubricant. In no case shall wire be repulled if same has been pulled out of a conduit run for any purpose. No conductor shall be pulled into conduit until conduit system is complete, including junction boxes, pull boxes, etc.

3.2 All connections of wires shall be made as noted below:

3.2.1 Connections to outlets and switches: Wire formed around binding post of screw.

3.2.2 No. 10 wire and smaller: Circuit wiring connections to lighting fixtures and other hard wired equipment shall be made with pressure type solderless connectors, Buchanan, Scotchlock, Wing Nut, or approved equal. Alternate "WAGO" #773 series or "IDEAL" #32, 33, 34 and 39 series push wire style connectors are also acceptable.

3.3 All wiring shall be continuous without splicing unless where specifically noted on the drawings or where permitted below.

3.3.1 No. 10 wire and smaller above grade: Quantities as needed, connection made with pressure type solderless connectors, Scotchlock or equal.

3.3.2 No. 10 wire and smaller below grade: Quantities as needed, connection made with 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.3 No. 8 wire and larger above grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.4 No. 8 wire and larger below grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.4 All wiring throughout shall be color coded as follows:

	<u>480 volt system</u>	<u>208 or 240 volt system</u>
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral	Grey	White
Ground	Green	Green

3.5 Wiring must be color coded throughout its entire length, except feeders may have color coded plastic tape at both ends and any other accessible point.

3.6 All control wiring in a circuit shall be color coded, each phase leg having a separate color, and with all segments of the control circuit, whether in apparatus or conduit, utilizing the same color coding.

3.7 At all terminations of control wiring, the wiring shall have a numbered T&B or Brady plastic wire marker.

3.8 Cables when installed are to be properly trained in junction boxes, etc., and in such a manner as to prevent any forces on the cable which might damage the cable.

3.9 All conductors to be installed into a common raceway, shall be pulled into the raceway at the same time.

3.10 All conductors shall be installed in such a manner as to not exceed the manufacturers' recommended pulling tension and bending radius. The equipment used for pulling must be specifically designed for the purpose. Motorized vehicles such as pickup trucks, are not acceptable.

END OF SECTION

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SECTION 26 05 26

GROUNDING

PART 1 – GENERAL

- 1.1 Furnish and install grounding and grounding conductors and electrodes as specified herein and as shown on the drawings.
- 1.2 Submit catalog data for all components.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not including all items listed in the above itemized description.
 - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – EXECUTION

- 2.1 Grounding
 - 2.1.1 All panelboard cabinets, equipment, enclosures, and complete conduit system shall be grounded securely in accordance with pertinent sections of CEC Article 250. Conductors shall be copper. All electrically operated equipment shall be bonded to the grounded conduit system. All non-current carrying conductive surfaces that are likely to become energized and subject to personal contact shall be grounded by one or more of the methods detailed in CEC Article 250. All ground connections shall have clean contact surfaces. Install all grounding conductors in conduit and make connections readily accessible for inspection.
 - 2.1.2 Provide an insulated equipment grounding conductor in all branch circuit and feeder raceway systems, sized in accordance with CEC 250-1122.
 - 2.1.3 Provide an additional individual insulated grounding conductor for each circuit which contains an isolated ground receptacle or surge suppression receptacle.
 - 2.1.4 Grounding of metal raceways shall be assured by means of provisions of grounding bushings on feeder conduit terminations at the panelboard, and by means of insulated continuous stranded copper grounding wire extended from the ground bus in the panelboard to the conduit grounding bushings.

- 2.1.5 Except for connections which access for periodic testing is required, make grounding connections which are buried or otherwise inaccessible by exothermite type process.

- 2.1.6 The following ohmic values shall be test certified for each item listed. A written report signed and witnessed by the project IOR shall be provided to the engineer. If the ohmic value listed cannot be obtained additional grounding shall be installed to reach the value listed.
 - 2.1.6.1 Service. 10 ohms.

 - 2.1.6.2 Step down transformers and non-current carrying metal parts
..... 25 ohms.

 - 2.1.6.3 Manholes, handholes, etc.
..... 10 ohms.

END OF SECTION

SECTION 26 05 33
CONDUIT AND FITTINGS

PART 1 – GENERAL

- 1.1 Furnish and install conduit and fittings as shown on the drawings and as specified herein.
- 1.2 Submit Manufacturer's data on the following:
 - 1.2.1 Conduit.
 - 1.2.2 Fittings
 - 1.2.3 Fire stopping Material.
 - 1.2.4 Surface Raceways.
 - 1.2.5 Type MC or MC-PCS cable, provide construction details and UL "E" number.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not including all items listed in the above itemized description.
 - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 Rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT) and flexible metallic conduit shall be steel, hot dipped galvanized after fabrication.
- 2.2 PVC conduit shall be Carlon or approved equal.
- 2.3 Liquid tight flexible metal conduit shall be Anaconda Sealtite type UA or approved equal. Fittings shall be Appleton, Crouse-Hinds, Steel City, T&B, or equivalent.
- 2.4 MC type armored cable, when utilized, shall be provided with the following:
 - 2.4.1 Comply with UL 1479 and CEC 330

- 2.4.2 90°C, copper, THHN conductors.
- 2.4.3 Minimum #12 insulated grounding conductor.
- 2.4.4 Conductors sized No. 10 and smaller shall be solid, No. 8 and larger shall be stranded.
- 2.4.5 Oversized (150%) neutrals or separate neutrals shall be provided.
- 2.4.6 Increase phase conductors to No. 10 AWG for 120 volt circuits greater than 100 feet from panel to load and for 277 volt circuits greater than 200 feet from panel to load. Where required increase conductor sizes for entire length of circuit.
- 2.4.7 Interlocked armored aluminum sheath.
- 2.4.8 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
- 2.4.9 Color code cable according to cable type and configuration.
- 2.4.10 Acceptable manufacturers are AFC and Alflex.
- 2.5 MC-PCS luminary armored cable , when utilized, shall be provided with the following:
 - 2.5.1 Comply with UL 1479 and CEC 330
 - 2.5.2 90°C, copper, THHN conductors.
 - 2.5.3 Minimum #12 insulated grounding conductor.
 - 2.5.4 Lighting phase conductors sized No. 10 and smaller shall be solid, lighting control conductors shall be sized no. 16 solid.
 - 2.5.5 Interlocked armored aluminum sheath.
 - 2.5.6 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
 - 2.5.7 Color code phase cable according to cable type and configuration. color code control conductors purple/gray.
 - 2.5.8 Acceptable manufacturers are AFC and Alflex.
- 2.6 Fire stopping material shall provide an effective seal against fire, heat, smoke and fire gases. Fire stopping material shall be tested to comply with ASTM E 814 and UL 1479. The submittal for this product shall include the UL listed system number and installation requirements for each type of penetration seal required for this project.

- 2.7 Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.
- 2.8 All plastic conduit shall be rigid, schedule 40, heavy wall PVC. All PVC conduit shall be UL listed. Underground utility company conduits shall comply with local utility co. requirements.
- 2.9 Plastic conduit shall be stored on a flat surface, and protected from the direct rays of the sun.
- 2.10 Where branch circuit or communication raceways cannot be concealed in ceilings or walls and are required to be exposed in interior spaces, provide nonmetallic surface raceway system sized per the manufacturer capacity requirements. A full complement of nonmetallic fittings must be available and matching device boxes and cover plates must be provided. The color of the raceway system, components and boxes shall be (white). Where data networking cabling is to be installed, all raceway fittings shall meet Category 5 radius requirements. Where specific raceway types have been noted on the drawings they shall be as follows:

2.10.1 System 'SR'	Hubbell Wiremold Panduit Hellerman-Tyton	WALLTRAK 1 series ECLIPSE PN05series LD5 series TSR2 series
2.10.2 System 'SR2'	Hubbell Wiremold Panduit Hellerman-Tyton	WALTRAK 22 2300D Series D2P10 TSR3 series
2.10.3 System 'SR3'	Hubbell Wiremold Panduit Hellerman-Tyton	BASETRAK series 5400 - series 70 series MCR Infostream" series

Provide with offset boxes, inline boxes may only be used where specifically shown on the drawings.

PART 3 – FITTINGS

- 3.1 All metallic fittings, including those for EMT, flexible conduit, or malleable iron. Die cast fittings of any other material are not permitted.
- 3.2 Locknuts shall be steel or malleable iron with sharp clean cut threads.
- 3.3 Entrance seals shall be O.Z. type FSK or equivalent.

- 3.4 Bushings and locknuts: Where conduits enter boxes, panels, cabinets, etc., they shall be rigidly clamped to the box by locknuts on the outside, and a lock nut and plastic bushing on the inside of the box. All conduits shall enter the box squarely.
- 3.5 Furnish and install insulated bushings as per CEC article No. 300 - 4 (F) on all conduits. The use of insulated bushings does not exclude the use of double locknuts to fasten conduit to the box.
- 3.6 Transition from plastic to steel conduits shall be with PVC female threaded adaptors.
- 3.7 Couplings and connectors for rigid steel or IMC conduit must be threaded, or compression type (set screw fittings are not permitted).
- 3.8 Couplings and connectors for EMT shall be compression, watertight. Set screw connectors are not acceptable, except for systems below 120 volts.
- 3.9 MC or MC-PCS type armored cable shall be provided with listed clamp type die cast zinc set screw connectors. Anti-short bushings shall be provided at all cable ends.
- 3.10 Connectors for flexible metal conduit shall be steel or malleable iron with screw provided to clinch the conduit into the adapter body. For sizes up to $\frac{3}{4}$ " a screw-in, "Jake type," fitting may be used.
- 3.11 Install approved expansion fittings, or liquid tight flex conduit with a minimum 6" slack for conduits passing through all expansion and seismic joints.

PART 4 - EXECUTION

- 4.1 All branch circuits shall be installed concealed in walls or above ceilings or in concrete floor slabs. PVC conduits installed in concrete floor slabs shall transition to PVC coated rigid steel where conduits penetrate above finished grade or finished floor.
- 4.2 Conduit sizes for various numbers and sizes of wire shall be as required by the CEC, but not smaller than $\frac{1}{2}$ " for power wiring and $\frac{3}{4}$ " for communications and fire alarm systems unless otherwise noted. Conduit in slab or below grade shall be $\frac{3}{4}$ " minimum trade size, unless otherwise identified.
- 4.3 Conduit size shall be such that the required number and sizes of wires can be easily pulled in and the Contractor shall be responsible for the selection of the conduit sizes to facilitate the ease of pulling. Conduit sizes shown on the drawings are minimum sizes in accordance with appropriate tables in the CEC. If because of bends or elbows a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.
- 4.4 The Contractor shall be entirely responsible for the proper protection of this work from the other trades on the job. When conduit becomes bent or holes are punched through same, or outlets moved after being roughed-in, the Contractor shall replace same, without additional cost to the Owner.

- 4.5 Rigid steel conduit or IMC shall be used as follows:
 - 4.5.1 Exposed exterior locations.
 - 4.5.2 Exposed interior locations below eight feet above floor, except in electrical rooms and closets.
 - 4.5.3 In hazardous or classified areas as required by CEC.
- 4.6 EMT conduit shall be used for areas as follows:
 - 4.6.1 All interior communications, signal, and data networking systems.
 - 4.6.2 All interior power wiring systems where not required to be in rigid steel, IMC or flexible conduit.
- 4.7 Flexible conduit shall be used for areas as follows:
 - 4.7.1 To connect motors, transformers, and other equipment subjected to vibration or where specifically detailed on the drawings.
 - 4.7.2 Flexible conduit shall not be used to replace EMT in other locations where the conduit will be exposed.
 - 4.7.3 Flexible metal conduit shall be ferrous. Installation shall be such that considerable slack is realized. The conduit shall contain separate code sized grounding conductor.
 - 4.7.4 Liquid tight flexible conduit shall be used in conformance with CEC in lengths not to exceed 4'. For equipment connections, route the conduit at 90 degrees to the adjacent path for point of connection. The conduit shall contain separate code sized grounding conductor. Use liquid tight flexible conduit for all equipment connections exposed in possible wet, corrosive or oil contaminated areas, e.g., shops and outside areas.
- 4.8 MC armored cable may be used as follows:
 - 4.8.1 All branch circuit wiring for lighting and power circuits where permitted and installed in compliance with UL 1569 and CEC 330.
- 4.9 MC-PCS luminary armored cable may be used as follows:
 - 4.9.1 All Lighting branch circuit wiring for lighting circuits where permitted and installed in compliance with UL 1569 and CEC 300-22(c), 330. This cable permits conductors of control circuits to be placed in a cable with lighting power circuits or class 1 circuits.

- 4.9.2 It shall not be considered an acceptable option to install lighting control class 1 circuits as an open wire installation.
- 4.10 MC and MC-PCS armored cable shall **not** be used for the following areas:
- 4.10.1 Any exterior, underground or buried in concrete circuits.
- 4.10.2 Any circuits feeding HVAC equipment or pumps or any circuit with 30 AMPs or greater overcurrent protection.
- 4.10.3 Any exposed interior locations except in electrical, communication or mechanical equipment rooms.
- 4.10.4 Any exposed interior damp/wet locations, kitchens, science classrooms, shop areas, or concealed in science classroom casework, unless provided with approved PVC jacket.
- 4.10.5 Any hazardous rated area.
- 4.11 Plastic conduit shall be used for all exterior underground, in slab, and below slab on grade conduit installations. Install bell ends at all conduit terminations in manholes and pull boxes. Where plastic conduit transitions from below grade to above grade, no plastic conduit shall extend above finished exterior grade, or above interior finished floor level.
- 4.12 Plastic conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected. Conduit joint couplings shall be made watertight. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly.
- 4.13 All underground conduit depths shall be as detailed on the drawings or a minimum of 30" below finished grade (when not specifically detailed otherwise), for all exterior underground conduits. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.
- 4.14 All underground conduits for power systems (600v and higher), shall be concrete encased and a minimum of 48" below grade or as detailed on the drawings. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.
- 4.15 Conduit shall be continuous from outlet to outlet, cabinet or junction box, and shall be so arranged that wire may be pulled in with the minimum practical number of junction boxes.
- 4.16 All conduits shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, electrical closets, and in

existing or unfinished spaces. No conduit shall be run exposed in finished areas without the specific approval of the Architect.

- 4.17 All raceways which are not buried or embedded in concrete shall be supported by straps, clamps, or hangers to provide a rigid installation. Exposed conduit shall be run in straight lines at right angles to or parallel with walls, beams, or columns. In no case shall conduit be supported or fastened to other pipes or installed to prevent the ready removal of other trades piping. Wire shall not be used to support conduit.
- 4.18 It shall be the responsibility of the Contractor to consult the other trades before installing conduit and boxes. Any conflict between the location of conduit and boxes, piping, duct work, or structural steel supports, shall be adjusted before installation. In general, large pipe mains, waste, drain, and steam lines shall be given priority.
- 4.19 Conduits above lay-in grid type ceilings shall be installed in such a manner that they do not interfere with the "lift-out" feature of the ceiling system. Conduit runs shall be installed to maintain the following minimum spacing wherever practical.
 - 4.19.1 Water and waste piping not less than 3".
 - 4.19.2 Steam and steam condensate lines not less than 12".
 - 4.19.3 Radiation and reheat lines not less than 6".
- 4.20 Provide all necessary sleeves and chases required where conduits pass through floors or walls as part of the work of this section. Core drilling will only be permitted where approved by the Architect.
- 4.21 All empty conduits and surface mounted raceways shall be provided with a ¼" polypropylene plastic pull cord and threaded plastic or metal plugs over the ends. Fasten plastic "Dymo" tape label to exposed spare conduit to identify "power" or "communication" system, and to where it goes.
- 4.22 The ends of all conduits shall be securely plugged, and all boxes temporarily covered to prevent foreign material from entering the conduits during construction. All conduit shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place.
- 4.23 Bending: Changes in direction shall be made by bends in the conduit. These shall be made smooth and even without flattening the pipe or flaking the finish. Bends shall be of as long a radius as possible, and in no case smaller than CEC requirements.
 - 4.23.1 For power conduits for conductors (600v and below), provide minimum 36" radius (vertical) and 72" radius (horizontal) bends.
 - 4.23.2 For power conduits for conductors (greater than 600v), provide minimum 72" radius (vertical) and 72" radius (horizontal) bends.

- 4.24 Supports: Conduit shall be supported at intervals as required by the California Electrical Code. Where conduits are run individually, they shall be supported by approved conduit straps or beam clamps. Straps shall be secured by means of toggle bolts on hollow masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. [No perforated straps or wire hangers of any kind will be permitted. Where individual conduits are routed, or above ceilings, they shall be supported by hanger rods and hangers.] Conduits installed exposed in damp locations shall be provided with clamp backs under each conduit clamp, to prevent accumulation of moisture around the conduits.
- 4.25 Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers. Hanger rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set flush with surface. A reinforced rod shall be installed through the opening provided in the concrete inserts. Beam clamps shall be suitable for structural members and conditions. Rods shall be galvanized steel 3/8" diameter minimum. Each conduit shall be clamped to the trapeze hanger with conduit clamps.
- 4.26 All concrete inserts and pipe clamps shall be galvanized. All steel bolts, nuts, washers, and screws shall be galvanized or cadmium plated. Individual hangers, trapeze hangers and rods shall be prime-coated.
- 4.27 Openings through fire rated floors/walls and/or smoke walls through which conduits pass shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. Sleeves shall be provided for power or communication system cables which are not installed in conduits, and shall be sealed inside and out to comply with manufacturers UL system design details. Where multiple conduits and/or cable tray systems pass thru fire-rated walls at one location, the Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.
- 4.28 Provide cap or other sealing type fitting on all spare conduits. Conduits stubbed into buildings from underground where cable only extends to equipment, the conduit/cable end shall be sealed to prevent moisture from entering the room or space.
- 4.29 All conduits which are part of a paralleled feeder or branch circuit shall be installed underground.
- 4.30 All conduits which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.
- 4.30.1 The Contractor shall coordinate all conduit requirements with each system supplier prior to bid to determine special conduit system requirements.
- 4.30.2 The Contractor shall provide a pull rope in all conduits for these systems.

- 4.30.3 The Contractor shall provide conduit sleeves for all open cable installations thru rated walls or block walls. Provide conduit from each building main termination cabinet or backboard to the nearest accessible ceiling for access into all electrical or communications rooms.
- 4.31 In addition to the above requirements, the following requirements shall apply to all data networking conduits:
- 4.31.1 Flexible metal conduit may only be used where required at building seismic and/or expansion joints.
- 4.31.2 All underground conduits shall be provided with minimum 24" radius elbows (vertical) and 60" (horizontal).
- 4.31.3 No length of conduit above grade shall be installed to exceed 150 feet between pull boxes, or points of connection, unless where specifically detailed on the drawings.
- 4.31.4 No length of conduit shall be installed to exceed two 90 degree bends between pull boxes, or points of connection, unless where specifically detailed on the drawings.
- 4.32 Where surface raceways are installed in interior spaces, the Contractor shall take care to route in straight lines at right angles to or parallel with walls, beams, or columns. All raceways and device boxes shall be securely screwed to the finish surface with zinc screw "Auger" anchors Stk #ZSA1K by Gray Bar Electric or equal. Tape adhesive application will not be permitted.
- 4.33 The Contractor who installs surface raceway systems shall provide and install complete with wire retention clips, one for every (8) vertical feet or (5) horizontal feet or portion thereof. This Contractor shall also provide each raceway channel with pull strings.
- 4.34 It shall be the responsibility of the Contractor installing the raceway to coordinate the installation of raceway device plates and inserts with the communications or data contractors.
- 4.35 MC or MC-PCS cable shall be cut using a specific metallic sheath armor stripping tool. The use of hacksaws, dikes or any other tools not specifically designed to remove the armor sheath will not be permitted.
- 4.36 MC or MC-PCS cables installed in attic spaces or above lay-in ceilings shall be installed to be protected from physical damage. The cable shall be mounted along the sides or bottom of joists, rafters or studs.
- 4.37 Support wires used for supporting ceilings, lighting fixtures or other equipment items shall **not** be used to support MC or MC-PCS cables. Conduits, duct work, piping or any other equipment shall not be used to support or mount MC cables.

- 4.38 MC or MC-PCS cable supports, fasteners and clips shall be designed specifically for use with MC cables. Standard conduit supports, fasteners and clips, nails or other items are not permitted for installing MC cables.

END OF SECTION

SECTION 26 05 34
OUTLET AND JUNCTION BOXES

PART 1 – GENERAL

- 1.1 Furnish and install electrical wiring boxes as specified and as shown on the electrical drawings.
- 1.2 Submit manufacturer's data for all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not including all items listed in the above itemized description.
 - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 Boxes shall be as manufactured by Steel City, Appleton, Raco, or approved equal.
- 2.2 All boxes must conform to the provisions of Article 370 of the CEC. All boxes shall be of the proper size to accommodate the quantity of conductors enclosed in the box. Minimum box size shall be 4" square x 1-½" deep.
- 2.3 Boxes generally shall be hot dipped galvanized steel with knockouts. Boxes on exterior surfaces or in damp locations shall be corrosion resistant, cast ferrous and shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Boxes shall be Appleton Type FS, Crouse-Hinds, or the approved equal. Conduit bodies shall be corrosion resistant, cast malleable iron. Conduit bodies shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Conduit bodies shall be Appleton Unilets, Crouse-Hinds, or the approved equal. Where recessed, boxes shall have square cut corners.
- 2.4 Deep boxes shall be used in wall covered by wainscot or paneling and in walls or glazed tile, brick, or other masonry which will not be covered with plaster. Through the wall type boxes shall not be used unless specifically called for. All boxes shall be nongangable. Boxes in concrete shall be of a type to allow the placing of conduit

without displacing the reinforcing bars. All lighting fixture outlet boxes shall be equipped with the proper fittings to support and attach a light fixture.

- 2.5 All light, switch, receptacle, fire alarm devices and similar outlets shall be provided with approved boxes, suitable for their function. Back boxes shall be furnished and installed as required for the equipment and/or systems under this contract.
- 2.6 Pull and junction boxes shall be code gauge boxes with screw covers. Boxes shall be rigid under torsional and deflecting forces and shall be provided with angle from framing where required. Boxes shall be 4" square with a blank cover in unfinished areas and with a plaster ring and blank cover in finished areas. Covers for flush mounted oversize boxes shall extend $\frac{3}{4}$ " past boxes all around. Covers for 4" square boxes shall extend $\frac{1}{4}$ " past box all around.
- 2.7 All terminal cabinets and junction boxes or equipment back boxes which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.
 - 2.7.1 The Division 26 Contractor shall coordinate all box requirements with each system supplier prior to bid to determine special cabinet or back box requirements. The Contractor shall also provide stainless steel blank cover plates for all low voltage systems installed for future equipment.
 - 2.7.2 The Contractor shall provide all plywood backboards indicated on walls or inside equipment enclosures. All backboards shall be a minimum of $\frac{3}{4}$ " thick fire rated type plywood.
 - 2.7.3 The Contractor shall coordinate exact rough in locations and requirements with each system supplier.
- 2.8 In addition to the above requirements, boxes for data networking wiring and equipment shall comply with the following:
 - 2.8.1 All boxes shall be a minimum of 4-11/16" square x 2-1/8" deep.
 - 2.8.2 Where pull boxes are required on individual conduits 1- $\frac{1}{4}$ " or smaller, provide 4-11/16" square x 2-1/8" deep boxes. Where pull boxes are required on conduits larger than 1- $\frac{1}{4}$ " for straight pull through, provide eight times the conduit trade size for box length. Where pull boxes are required on conduits larger than 1- $\frac{1}{4}$ " for an angle or a U-pull through installation, provide a minimum distance of six times the conduit trade size between the entering and exiting conduit run for each cable.
- 2.9 Recessed boxes installed in fire rated floors/walls and /or smoke walls shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. The Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-

rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.

PART 3 – EXECUTION

- 3.1 Boxes shall be installed where required to pull cable or wire, but in finished areas only by approval of the Architect. Boxes shall be rigidly attached to the structure, independent of any conduit support. Boxes shall have their covers accessible. Covers shall be fastened to boxes with machine screws to ensure continuous contact all around. Covers for surface mounted boxes shall line up evenly with the edges of the boxes.
- 3.2 Outlets are only approximately located on the plans and great care must be used in the actual location of the outlets by consulting the various detailed drawings and specifications. Outlets shall be flush with finished wall or ceiling, boxes installed symmetrically on such trim or fixture. Refer to drawings for location and orientation of all outlet boxes.
- 3.3 Furnish and install all plaster rings as may be required. Plaster rings shall be installed on all boxes where the boxes are recessed. Plaster rings shall be of a depth to reach the finished surface. Where required, extension rings shall be installed so that the plaster ring is flush with the finished surface.
- 3.4 All cabinets and boxes shall be secured by means of toggle bolts on hollow masonry; expansion shields and machine screws or standard precast inserts on concrete or solid masonry; machine screws or bolts on metal surfaces and wood screws on wood construction. All wall and ceiling mounted outlet boxes shall be supported by bar supports extending from the studs or channels on either side of the box. Boxes mounted on drywall or plaster shall be secured to wall studs or adequate internal structure.
- 3.5 Boxes with unused punched-out openings shall have the openings filled with factory-made knockout seals.
- 3.6 Where standby power and normal power are to be located in the same outlet box or 480V in a switch box, install partition barriers to separate the various systems.
- 3.7 All device boxes and junction boxes for fire alarm system shall be painted red and shall be 4-11/16" square by 2-1/8" deep. No exceptions.

END OF SECTION

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SECTION 26 08 00
COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 – GENERAL

RELATED DOCUMENTS

- 1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, 27, 28 Specification Sections, apply to this Section.
- 1.2 Acceptance and start-up testing requirements for electrical power distribution equipment and systems. Contractor shall retain and pay for the services of a recognized, independent testing firm for the purpose of performing inspections and tests as herein specified and as required by code.
 - 1.2.1 The testing firm shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.
 - 1.2.2 It is the purpose of these tests to assure that all tested electrical equipment is operational and within industry and manufacturers tolerances, and is installed in accordance with design specifications.
 - 1.2.3 The tests and inspections shall determine suitability for start-up and energization.
 - 1.2.4 The following equipment shall be tested and calibrated:
 - 1.2.4.1 Medium voltage cables
 - 1.2.4.2 Medium voltage interrupter switches, fuses, and circuit breakers.
 - 1.2.4.3 Low voltage switches, fuses, and circuit breakers, 100A frame and larger.
 - 1.2.4.4 Low voltage cables and feeders.
 - 1.2.4.5 Motor Control Centers and adjustable frequency drives.
 - 1.2.4.6 Protective relays, instruments, and metering systems.

CODES, STANDARDS, AND REFERENCES

- 1.3 All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein.
 - 1.3.1 ANSI/IEEE C2: National Electrical Safety Code (NESC).
 - 1.3.2 ANSI/NFPA 70: National Electrical Code, with California Amendments (CEC).

- 1.3.3 ANSI/NFPA 70E: Standard for Electrical Safety in the Workplace.
- 1.3.4 ANSI/NFPA 78: Lightning Protection Code.
- 1.3.5 ANSI/NFPA 101: Life Safety Code.
- 1.3.6 American Society for Testing and Materials – ASTM.
- 1.3.7 Applicable State and Local Codes, Ordinances and Standards, including City of San Diego, San Diego Gas & Electric, and San Diego Unified School District.
- 1.3.8 California Code of Regulations (CCR), Title 8, Title 24.

- 1.3.10 Institute of Electrical and Electronic Engineers – IEEE.
- 1.3.11 Insulated Cable Engineers Association – ICEA.
- 1.3.12 International Electrical Testing Association - NETA Accept: The NETA Acceptance Testing Specifications, latest edition.
- 1.3.13 National Electrical Manufacturers Association – NEMA.
- 1.3.14 Occupational Safety and Health Administration (OSHA) – 29 CFR 1910.7: OSHA Occupational Safety and Health Standards.

QUALIFICATION OF TESTING FIRM

- 1.4 All Inspections and tests shall utilize the following references:
 - 1.4.1 Project design specifications.
 - 1.4.2 Project design drawings
 - 1.4.3 Project list of equipment to be inspected and tested
 - 1.4.4 Manufacturer's instruction manuals applicable to each particular equipment.
- 1.5 The testing firm shall be an independent testing organization with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- 1.6 The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems, with at least five (5) years of documented experience.

- 1.7 The lead, on-site, technical person shall be currently certified by the International Electrical Association (NETA), or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.
- 1.8 The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.
- 1.9 The testing firm shall submit proof of the above qualifications with bid documents when requested.
- 1.10 The terms used herein, such as Testing Agency, Testing Contractor, Testing Laboratory, or Contractor Test Company, shall be construed to mean the testing firm.

SUBMITTALS

- 1.11 Provide submittals per Division 1, Section 013000, "Submittal Procedures".
- 1.12 Qualifications of testing firm and personnel.
- 1.13 Certified test reports.
- 1.14 Two copies of blank forms for checklists, test reports, and other related forms for Engineer's review and approval.

GENERAL REQUIREMENTS

- 1.15 Routine insulation resistance, continuity, and rotation tests for all distribution and utilization equipment shall be performed prior to and in addition to acceptance tests specified herein.
- 1.16 The Testing Firm shall notify the Engineer no fewer than 3 working days prior to commencement of any testing.
- 1.17 Any system, material, or workmanship, which is found defective on the basis of Acceptance Tests shall be reported to the Engineer with recommendations for corrective action.
- 1.18 The Testing Firm shall maintain a written record of all tests, and upon completion of project, shall assemble and certify a final test report.
- 1.19 The final Test Report shall be submitted on conclusion of all required tests and corrective measures.

SAFETY AND PRECAUTIONS

- 1.20 Safety practices shall include, but will not be limited to, compliance with the following requirements:
 - 1.20.1 Occupational Safety and Health Act.

- 1.20.2 Accident Prevention Manual for Industrial Operations, National Safety Council.
- 1.20.3 Applicable State and Local safety operating procedures.
- 1.20.4 Owners' Safety Practices.
- 1.20.5 National Fire Protection Association – NFPA 70E.
- 1.20.6 American National Standards for Personnel Protection.
- 1.21 All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and adequate safeguards must be devised.
- 1.22 The Testing Firm shall have a designated safety representative on the project site to supervise the testing operations with respect to safety.
- 1.23 Test Report:
 - 1.23.1 The test report shall include the following:
 - 1.23.1.1 Summary of Project.
 - 1.23.1.2 List of testing equipment used.
 - 1.23.1.3 Calibration date of testing equipment and due date of next calibration.
 - 1.23.1.4 Ambient temperature and humidity at time of test.
 - 1.23.1.5 Listing of equipment tested.
 - 1.23.1.6 Test results.
 - 1.23.1.7 Recommendations.
 - 1.23.2 Furnish original and four copies of the complete report to the Architect/District in accordance with requirements of Contract Documents.

INSPECTION AND TEST PROCEDURES

- 1.24 Contractor shall provide the Testing Firm, a copy of related contract documents such as drawings, specifications, engineer-reviewed submittals, coordination study report including all relay settings and other necessary information.
- 1.25 Contractor shall supply a suitable source of power to each site and location per testing firm requirements.
- 1.26 Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

- 1.27 Testing Firm shall review and evaluate all received documents and notify the Contractor and Engineer of any discrepancies in the documents and/or any other requirements immediately.
- 1.28 Testing Firm shall provide and comply with the following:
 - 1.28.1 Acceptance test procedures for each individual equipment listed in Part 1 of this section for Engineer review and approval prior to any test and after thorough evaluation of the system. Testing shall conform to the International Electrical Testing Association (NETA) specifications and standards for electrical power distribution equipment and systems and manufacturer's instructions.
 - 1.28.2 Refer to each individual specification section for testing requirements and comply.
 - 1.28.3 Inspect installed equipment and report any discrepancy and/or deficiency with respect to the contract documents and governing codes prior to testing.

SYSTEM FUNCTION TEST

- 1.29 Perform system function test upon completion of equipment tests as defined in this section. It is the purpose of system function tests to verify proper interaction of all sensing, processing, and action devices.
- 1.30 Implementation.
- 1.31 Submit manufacturers' data on all items:
 - 1.31.1 Develop test parameters for the purpose of evaluation performance of all integral components and their functioning as a complete unit within design requirements.
 - 1.31.2 Test all interlocking devices.
 - 1.31.3 Record the operation of alarms and indicating devices.
- 1.32 DEFICIENCIES
- 1.33 Submit manufacturers' data on all items.
 - 1.33.1 All deficiencies reported by the Testing Firm shall be corrected by the Contractor and Acceptance and System Function Tests shall be repeated to verify conformance with requirements.

PART 2 – PRODUCTS

- 2.1 Not applicable

PART 3 - EXECUTION

3.1 Not applicable

END OF SECTION

SECTION 26 09 23
DIGITAL LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

- 1.1 Furnish and install automatic lighting controls as shown on the drawings and as specified herein Submit manufacturers' data on all items.
- 1.2 Equipment shall be UL listed, comply with those portions of CEC as applicable to electrical wiring work and comply with those portions of NEMA or UL pertaining to types of electrical equipment and enclosures. The equipment shall also be certified by the California Energy Commission.
- 1.3 The manufacturer of the lighting control equipment shall have been actively engaged in the manufacture of the types and capacities required for the application for at least three years. It is the sole responsibility of the Division 26 contractor to ensure that submittals of material meets the performance specifications contained herein.
- 1.4 All components and assemblies shall be factory pre-tested and burned-in as a system for 48 hours prior to shipping.
- 1.5 Control Intent – Control Intent includes, but is not limited to:
 - 1.5.1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
 - 1.5.2 Initial sensor and switching zones
 - 1.5.3 Initial time switch settings
 - 1.5.4 Task lighting and receptacle controls
 - 1.5.5 Emergency Lighting control (if applicable)
 - 1.5.6 Manufacturer shall submit a point-to-point line diagram of the system configuration including all devices and accessories required to complete the system.
 - 1.5.7 Manufacturer shall submit data sheets on the components and system submitted, with descriptions of hardware and software components.

SYSTEM DESCRIPTION & OPERATION

- 1.6 The Lighting Control and Automation system as defined under this section covers the following equipment:
 - 1.6.1 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications

- 1.6.2 Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications
- 1.6.3 Handheld remotes for personal control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools
- 1.6.4 Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting
- 1.6.5 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities
- 1.6.6 Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities
- 1.6.7 Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow bi-directional communication of room variables and occupancy sensor settings. Computer software also customizes room settings
- 1.6.8 Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices
- 1.6.9 Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control
- 1.6.10 Network Bridge – provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects representative of connected devices.
- 1.6.11 Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting
- 1.6.12 Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication

- 1.6.13 LMCP Digital Lighting Management Relay Panel – provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS)
- 1.6.14 Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

LIGHTING CONTROL APPLICATIONS

- 1.7 Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:
 - 1.7.1 Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.
 - 1.7.2 Bi-Level Lighting – Provide multi-level controls in all spaces except toilet rooms, storerooms, library stacks, or applications where variable dimming is used
 - 1.7.3 Task Lighting / Plug Loads – Provide automatic shut off of non-essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area
 - 1.7.4 Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
 - 1.7.4.1 All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones
 - 1.7.4.2 Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes
 - 1.7.4.3 Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings

- 1.7.4.4 Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.
- 1.7.5 Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.
- 1.8 Submit shop drawings and manufacturers' data for all components including:
 - 1.8.1 Manufacturer shall submit in bill-of-material form an itemized list of all materials supplied to meet the specification.
 - 1.8.2 Manufacturer shall submit dimensional drawings of lighting control panel(s).
 - 1.8.3 Manufacturer shall submit a point-to-point line diagram of the system configuration including all devices and accessories required to complete the system.
 - 1.8.4 Manufacturer shall submit data sheets on the components and system submitted, with descriptions of hardware and software components
 - 1.8.5 Composite wiring and/or schematic diagram of each control circuit as proposed to be installed
 - 1.8.6 Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans. (Contractor must provide AutoCAD format reflected ceiling plans)
 - 1.8.7 Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies
 - 1.8.8 Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades

QUALITY ASSURANCE

- 1.9 Manufacturer: Minimum 10 years' experience in manufacture of lighting controls

PROJECT CONDITIONS

- 1.10 Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1.10.1 Ambient temperature: 0° to 40° C (32° to 104° F)

1.10.2 Relative humidity: Maximum 90 percent, non-condensing.

WARRANTY

- 1.11 Provide a five-year limited manufacturer's warranty on all room control devices and panels

MAINTENANCE

- 1.12 Spare Parts:

1.12.1 The contactor shall provide as a part of this contract additional Control modules of each type used, Switches of each type used, Daylight sensors, Ceiling mounted occupancy sensors, Wall mounted occupancy sensors, Room controller, etc, three (3) for each type. Any devices not required to be included during construction shall be delivered to the District at the completion of the project. **The quantities of these devices shall be listed as a part of the Phase 1 submittals.**

PART 2 – PRODUCTS

- 2.1 Acceptable Manufacturers: **WattStopper, Digital Lighting Management (DLM)**

Substitutions:

- 2.2 Bidder's wishing to obtain approval on manufacturers other than those specified in these specifications or on the drawings shall comply with the following procedures:

2.2.1 All substitution requests shall be submitted to the Architect / Engineer no less than 10 business days prior to the project bid opening date. Approvals when accepted will be issued in the form of an addendum to the contract. No consideration for substitutions will be provided after the award of the contract.

2.2.2 The substitution request must include a statement indicating how the substituted product may impact the completion of the project.

2.2.3 The substitution request must include a statement indicating the difference in price (both list price and Contractor price) between the specified product and the substitution.

2.2.4 The substitution request must include a detailed analysis indicating any differences between the specified product and the substitution.

- 2.2.5 Catalog literature for both the specified and the substitution shall be provided along with contact information of the manufacturer for the substituted product.
- 2.3 The contractor shall pay the Engineer (at their current standard hourly rates) for the time spent reviewing substitutions. These costs will be included as an addendum to be issued to all bidders to include in their proposals, and must be paid to the Engineer within 60 days of award of the project.

DIGITAL LIGHTING CONTROLS

- 2.4 Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

DIGITAL WALL SWITCH OCCUPANCY SENSORS

- 2.5 Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons
- 2.6 Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
 - 2.6.1 Digital calibration and pushbutton configuration for the following variables:
 - 2.6.1.1 Sensitivity – 0-100% in 10% increments
 - 2.6.1.2 Time delay – 1-30 minutes in 1 minute increments xx
 - 2.6.1.3 Test mode – Five second time delay
 - 2.6.1.4 Detection technology – PIR, Dual Technology activation and/or re-activation.
 - 2.6.1.5 Walk-through mode
 - 2.6.1.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network
 - 2.6.2 Programmable control functionality including:
 - 2.6.2.1 Each sensor may be programmed to control specific loads within a local network
 - 2.6.2.2 Sensor shall be capable of activating one of 16 user-definable lighting scenes.

- 2.6.2.3 Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
- 2.6.2.4 On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
 - 2.6.2.4.1 Ultrasonic and Passive Infrared
 - 2.6.2.4.2 Ultrasonic only
 - 2.6.2.4.3 Passive Infrared only
- 2.6.3 Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods
- 2.6.4 Two RJ-45 ports for connection to DLM local network
- 2.6.5 Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote person controls.
- 2.6.6 Device Status LEDs including:
 - 2.6.6.1.1 PIR detection
 - 2.6.6.1.2 Ultrasonic detection
 - 2.6.6.1.3 Configuration mode
 - 2.6.6.1.4 Load binding
- 2.6.7 Assignment of occupancy sensor to a specific load within the room without wiring or special tools
- 2.6.8 Assignment of local buttons to specific loads within the room without wiring or special tools
- 2.6.9 Manual override of controlled loads
- 2.6.10 All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.
- 2.7 BACnet object information shall be available for the following objects:
 - 2.7.1 Detection state

- 2.7.2 Occupancy sensor time delay
- 2.7.3 Occupancy sensor sensitivity, PIR and Ultrasonic
- 2.7.4 Button state
- 2.7.5 Switch lock control
- 2.7.6 Switch lock status
- 2.8 Units shall not have any dip switches or potentiometers for field settings
- 2.9 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required
- 2.10 Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence as a factory default:
 - 2.10.1 Left button
 - 2.10.1.1 Press and release – Turn load on
 - 2.10.1.2 Press and hold – Raise dimming load
 - 2.10.2 Right button
 - 2.10.2.1 Press and release – Turn off
 - 2.10.2.2 Press and hold – Lower diming load
- 2.11 Low voltage momentary pushbuttons shall include the following features:
 - 2.11.1 Load/Scene Status LED on each switch button with the following characteristics:
 - 2.11.1.1 Bi-level LED
 - 2.11.1.2 Dim locator level indicates power to switch
 - 2.11.1.3 Bright status level indicates that load or scene is active
 - 2.11.2 The following button attributes may be changed or selected using a wireless configuration tool:
 - 2.11.2.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
 - 2.11.2.2 Individual button function may be configured to Toggle, On only or Off only.

- 2.11.2.3 Individual scenes may be locked to prevent unauthorized change.
 - 2.11.2.4 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
 - 2.11.2.5 Ramp rate may be adjusted for each dimmer switch.
 - 2.11.2.6 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple load
- 2.12 WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening

DIGITAL WALL OR CELING MOUNTED OCCUPANCY SENSOR

- 2.13 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor
- 2.14 Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
- 2.14.1 Digital calibration and pushbutton configuration for the following variables:
 - 2.14.1.1 Sensitivity – 0-100% in 10% increments
 - 2.14.1.2 Time delay – 1-30 minutes in 1 minute increments
 - 2.14.1.3 Test mode – Five second time delay
 - 2.14.1.4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - 2.14.1.5 Walk-through mode
 - 2.14.1.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
 - 2.14.2 Programmable control functionality including:
 - 2.14.2.1 Each sensor may be programmed to control specific loads within a local network.
 - 2.14.2.2 Sensor shall be capable of activating one of 16 user-definable lighting scenes.

- 2.14.2.3 Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off
- 2.14.2.4 On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
 - 2.14.2.4.1 Ultrasonic and Passive Infrared
 - 2.14.2.4.2 Ultrasonic or Passive Infrared
 - 2.14.2.4.3 Ultrasonic only
 - 2.14.2.4.4 Passive Infrared only
- 2.14.3 Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
- 2.14.4 One or two RJ-45 port(s) for connection to DLM local network
- 2.14.5 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls
- 2.14.6 Device Status LEDs, which may be disabled for selected applications, including:
 - 2.14.6.1 PIR detection
 - 2.14.6.2 Ultrasonic detection
 - 2.14.6.3 Configuration mode
 - 2.14.6.4 Load binding
- 2.14.7 Assignment of occupancy sensor to a specific load within the room without wiring or special tools
- 2.14.8 Manual override of controlled loads
- 2.14.9 All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years
- 2.15 BACnet object information shall be available for the following objects:
 - 2.15.1 Detection state
 - 2.15.2 Occupancy sensor time delay

2.15.3 Occupancy sensor sensitivity, PIR and Ultrasonic

- 2.16 Units shall not have any dip switches or potentiometers for field settings
- 2.17 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.
- 2.18 WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

DIGITAL WALL SWITCHES

- 2.19 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
 - 2.19.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
 - 2.19.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
 - 2.19.3 Configuration LED on each switch that blinks to indicate data transmission.
 - 2.19.4 Load/Scene Status LED on each switch button with the following characteristics:
 - 2.19.4.1 Bi-level LED
 - 2.19.4.2 Dim locator level indicates power to switch
 - 2.19.4.3 Bright status level indicates that load or scene is active
 - 2.19.5 Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps
 - 2.19.6 Programmable control functionality including
 - 2.19.6.1 Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority.
 - 2.19.6.2 Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels
 - 2.19.7 All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years
- 2.20 BACnet object information shall be available for the following objects:

- 2.20.1 Button state
- 2.20.2 Switch lock control
- 2.20.3 Switch lock status
- 2.21 Two RJ-45 ports for connection to DLM local network
- 2.22 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching
- 2.23 The following switch attributes may be changed or selected using a wireless configuration tool:
 - 2.23.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa)
 - 2.23.2 Individual button function may be configured to Toggle, On only or Off only.
 - 2.23.3 Individual scenes may be locked to prevent unauthorized change.
 - 2.23.4 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours
 - 2.23.5 Ramp rate may be adjusted for each dimmer switch.
 - 2.23.6 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads
- 2.24 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening

HANDHELD REMOTE CONTROLS

- 2.25 Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:
 - 2.25.1 Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet
 - 2.25.2 LED on each button confirms button press
 - 2.25.3 Load buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads
 - 2.25.4 Inactivity timeout to save battery life

2.26 A wall mount holster and mounting hardware shall be included with each remote control

2.27 WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105

DIGITAL PARTITION CONTROLS

2.28 Partition controls shall enable manual or automatic coordination of lighting controls in flexible spaces with up to four moveable walls by reconfiguring the connected digital switches and occupancy sensors

2.29 Four-button low voltage pushbutton switch for manual control.

2.29.1 Two-way infrared (IR) transceiver for use with configuration remote control.

2.29.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall

2.29.3 Configuration LED on each switch that blinks to indicate data transmission.

2.29.4 Each button represents one wall; Green button LED indicates status.

2.29.5 Two RJ-45 ports for connection to DLM local network.

2.30 WattStopper part number: LMPS-104. Available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening

2.31 Contact closure interface for automatic control via input from limit switches on movable walls (by others).

2.31.1 Operates on Class 2 power supplied by DLM local network.

2.31.2 Includes 24VDC output and four input terminals for maintained third party contract closure inputs.

2.31.2.1 Input max. sink/source current: 1-5Ma

2.31.2.2 Logic input signal voltage High: >18VDC

2.31.2.3 Logic input signal voltage Low: <2VDC

2.31.3 Four status LEDs under hinged cover indicate if walls are open or closed; supports LMPS-104 as remote status indicator.

2.31.4 Two RJ-45 ports for connection to DLM local network.

2.32 WattStopper part number: LMIO-102

DIGITAL DAYLIGHTING SENSORS

- 2.33 Digital daylighting sensors shall work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller. Daylighting sensors shall be interchangeable without the need for rewiring
 - 2.33.1 Closed loop sensors measure the ambient light in the space and control a single lighting zone
 - 2.33.2 Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones
 - 2.33.3 Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone
- 2.34 Digital daylighting sensors shall include the following features:
 - 2.34.1 The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers
 - 2.34.2 Sensor light level range shall be from 1-6,553 footcandles (fc).
 - 2.34.3 The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
 - 2.34.4 For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.
 - 2.34.5 For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level
 - 2.34.6 Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
 - 2.34.7 Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off
 - 2.34.8 Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy

- 2.34.9 Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls
- 2.34.10 Configuration LED status light on device that blinks to indicate data transmission
- 2.34.11 Status LED indicates test mode, override mode and load binding.
- 2.34.12 Recessed switch on device to turn controlled load(s) ON and OFF.
- 2.34.13 BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
 - 2.34.13.1 Day and night setpoints
 - 2.34.13.2 Off time delay
 - 2.34.13.3 On and off setpoints
 - 2.34.13.4 Up to three setpoints
 - 2.34.13.5 Operating mode – on/off, bi-level, tri-level or dimming
- 2.34.14 One RJ-45 port for connection to DLM local network
- 2.35 A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62" thickness (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62"-1.25" thickness (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well
- 2.36 Any load or group of loads in the room can be assigned to a daylighting zone
- 2.37 Each load within a daylighting zone can be individually enabled or disabled for discrete control) load independence)
- 2.38 All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years

Closed loop digital photosensors shall include the following additional features:

- 2.39 An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
- 2.40 Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software

- 2.41 Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads

- 2.42 WattStopper Product Number: LMLS-400, LMLS-400-L

Open loop digital photosensors shall include the following additional features:

- 2.43 An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room
- 2.44 Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone
- 2.45 Each of the three discrete daylight zones can include any non-overlapping group of loads in the room

- 2.46 WattStopper Product Number: LMLS-500, LMLS-500-L

Dual loop photosensors shall include the following additional features:

- 2.47 Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside.
- 2.48 Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room
- 2.49 Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load
- 2.50 Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is require
- 2.51 Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes
- 2.52 Device must include extendable mounting arm to properly position sensor within a skylight well

2.53 WattStopper product number LMLS-600

DIGITAL ROOM CONTROLLERS AND PLUG – LOAD CONTROLLERS

2.54 Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:

2.54.1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room

2.54.2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf

2.54.3 Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest

2.54.4 Device Status LEDs to indicate:

2.54.4.1 Data transmission

2.54.4.2 Device has power

2.54.4.3 Status for each load

2.54.4.4 Configuration status

2.54.5 Quick installation features including:

2.54.5.1 Standard junction box mounting

2.54.5.2 Quick low voltage connections using standard RJ-45 patch cable

2.54.6 Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power

2.54.6.1 Turn on to 100%

2.54.6.2 Remain off

2.54.6.3 Turn on to last level

2.54.7 Each load shall be configurable to operate in the following sequences based on occupancy:

- 2.54.7.1 Auto-on/Auto-off (Follow on and off)
 - 2.54.7.2 Manual-on/Auto-off (Follow off only)
- 2.54.8 The priority of each load output shall be reversible, via digital configuration, so that on is off and off is on
- 2.54.9 BACnet object information shall be available for the following objects:
 - 2.54.9.1 Load status
 - 2.54.9.2 Electrical current
 - 2.54.9.3 Total watts per controller
 - 2.54.9.4 Schedule state – normal or after-hours
 - 2.54.9.5 Demand response control and cap level
 - 2.54.9.6 Room occupancy status
 - 2.54.9.7 Total room lighting and plug loads watts
 - 2.54.9.8 Total room watts/sq ft
 - 2.54.9.9 Force on/off all loads
- 2.54.10 UL 2043 plenum rated
- 2.54.11 Manual override and LED indication for each load
- 2.54.12 Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.
- 2.54.13 Zero cross circuitry each load
- 2.54.14 All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
- 2.55 On/Off Controllers shall include:
 - 2.55.1 One or two relay configuration
 - 2.55.2 Efficient 150 mA switching power supply
 - 2.55.3 Three RJ-45 DLM local network ports with integral strain relief and dust cover

- 2.55.4 WattStopper product numbers: LMRC-101, LMRC-102
- 2.56 On/Off/Dimming enhanced Room Controllers shall include:
 - 2.56.1 Real time current monitoring
 - 2.56.2 Multiple relay configurations
 - 2.56.2.1 One, two or three relays (LMRC-21 x series)
 - 2.56.2.2 One or two relays (LMRC-22x series)
 - 2.56.3 Efficient 250 mA switching power supply
 - 2.56.4 Four RJ-45 DLM local network ports with integral strain relief and dust cover
 - 2.56.5 Once dimming output per relay
 - 2.56.5.1 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)
 - 2.56.5.2 Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)
 - 2.56.5.3 Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver
 - 2.56.5.4 The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim
 - 2.56.5.5 Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim
 - 2.56.5.6 Calibration and trim levels must be set per output channel
 - 2.56.5.7 Devices that set calibration or trim levels per controller are not acceptable

- 2.56.5.8 All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable
- 2.56.6 Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events
- 2.56.7 Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value
- 2.56.8 The following dimming attributes may be changed or selected using a wireless configuration tool:
 - 2.56.8.1 Establish preset level for each load from 0-100%
 - 2.56.8.2 Set high and low trim for each load
 - 2.56.8.3 Set lamp burn in time for each load up to 100 hours
- 2.56.9 Override button for each load provides the following functions:
 - 2.56.9.1 Press and release for on/off control
 - 2.56.9.2 Press and hold for dimming control
- 2.57 WattStopper product numbers: LMRC-211, LRMC-212, LMRC-221, LMRC-222
- 2.58 Plug Load Room Controllers shall include the following:
 - 2.58.1 One relay configuration with additional connection for unswitched load
 - 2.58.2 Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated)
 - 2.58.3 Factory default operation is Auto-on/Auto-off, based on occupancy
 - 2.58.4 Real time current monitoring of both switched and un-switched load (LMPL-201 only)
 - 2.58.5 Efficient switching power supply
 - 2.58.5.1 150mA (LMPL-101)
 - 2.58.5.2 250mA (LMPL-201)
 - 2.58.6 RJ-45 DLM local network ports

2.58.6.1 Three RJ-45 ports (LMPL-101)

2.58.6.2 Four RJ-45 ports (LMPL-201)

2.59 Wattstopper product numbers: LMPL-101, LMPL-201

DLM LOCAL NETWORK (Room Network)

2.60 The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building

2.61 Features of the DLM local network include:

2.61.1 Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached

2.61.2 Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup

2.61.3 Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network

2.61.4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver

2.62 Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable

2.63 If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results

2.64 WattStopper Product Number: LMRJ-Series

DLM SEGMENT NETWORK (Room to Room Network)

2.65 The segment network shall be a linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and LMCP relay panels for centralized control

2.65.1 Each connected DLM local network shall include a single network bridge (LMBC-300), and the network bridge is the only room-based device that is connected to the segment network

- 2.65.2 Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate “in” and “out” terminations, for segment network connections
 - 2.65.3 The segment network shall utilize 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. The maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms
 - 2.65.4 Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device
 - 2.65.5 Substitution of manufacturer-supplied cable must be pre-approved: Manufacturer will not certify network reliability, and reserves the right to void warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer’s specific requirements
 - 2.65.6 Segment networks shall be capable of connecting to BACnet-compliant BAS (provided by others) either directly, via MS/TP, or through NB-ROUTERS, via BACnet/IP or BACnet/Ethernet. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable
- 2.66 WattStopper Product Number: LM-MSTP, LM-MSTP-DB

CONFIGURATION TOOLS

- 2.67 A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface
- 2.68 Features and functionality of the wireless configuration tool shall include but not be limited to:
 - 2.68.1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet
 - 2.68.2 High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation
 - 2.68.3 Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number

- 2.68.4 Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors
 - 2.68.5 Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings
 - 2.68.6 Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls
 - 2.68.7 Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings
 - 2.68.8 Verify status of building level network devices
- 2.69 WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

NETWORK BRIDGE

- 2.70 The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver
- 2.70.1 The network bridge shall be provided as a separate module connected on the local network through an available RJ-45 port
 - 2.70.2 Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network
 - 2.70.3 The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. BACnet objects will be created for the addition or replacement of any given in-room DLM device for the installed life of the system. Products requiring that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:
 - 2.70.3.1 Read/write the normal or after-hours schedule state for the room

- 2.70.3.2 Read the detection state of each occupancy sensor
- 2.70.3.3 Read the aggregate occupancy state of the room
- 2.70.3.4 Read/write the On/Off state of loads
- 2.70.3.5 Read/write the dimmed light level of loads
- 2.70.3.6 Read the button states of switches
- 2.70.3.7 Read total current in amps, and total power in watts through the room control
- 2.70.3.8 Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
- 2.70.3.9 Activate a preset scene for the room
- 2.70.3.10 Read/write daylight sensor fade time and day and night setpoints
- 2.70.3.11 Read the current light level, in footcandles, from interior and exterior photosensors and photocells
- 2.70.3.12 Set daylight sensor operating mode
- 2.70.3.13 Read/write wall switch lock status
- 2.70.3.14 Read watts per square foot for the entire controlled room
- 2.70.3.15 Write maximum light level per load for demand response mode
- 2.70.3.16 Read/write activation of demand response mode for the room
- 2.70.3.17 Activate/restore demand response mode for the room

2.71 Wattstopper product number: LMBC-300

SEGMENT MANAGER

- 2.72 For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443)
- 2.73 Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall

accommodate one segment network. Provide the quantity of routers and switches as shown on the plans

2.74 Operational features of the Segment Manager shall include the following:

- 2.74.1 Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic
- 2.74.2 Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. Shall not require installation of any lighting control software to an end-user PC
- 2.74.3 Log in security capable of restricting some users to view-only or other limited operations
- 2.74.4 Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels
- 2.74.5 After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the use
- 2.74.6 Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On
- 2.74.7 Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays, and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules
- 2.74.8 Ability to group rooms and loads for common control by schedules, switches or network commands
- 2.74.9 Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature
- 2.74.10 Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level;

panel channel schedule state; panel relay state; and Segment Manager Group schedule state control

2.74.11 The Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not acceptable

2.75 Segment Manager shall support multiple DLM rooms as follows

2.75.1 Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E)

2.75.2 Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E)

2.76 WattStopper Product Numbers: LMSM-3E, LMSM-6E, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16

PROGRAMMING, CONFIGURARION AND DOCUMENTATION SOFTWARE

2.77 PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication. Additional parameters exposed through this method include but are not limited to:

2.77.1 Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.

2.77.2 Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.

2.77.3 Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.

2.77.4 Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.

2.77.5 Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.

2.77.6 Load control polarity reversal so that on events turn loads off and vice versa.

2.77.7 Per-load DR (demand response) shed level in units of percent.

- 2.77.8 Load output pulse mode in increments of 1second.
- 2.77.9 Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer
- 2.78 Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
 - 2.78.1 Device list report: All devices in a project listed by type.
 - 2.78.2 Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
 - 2.78.3 BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
 - 2.78.4 Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
 - 2.78.5 Device parameter report: Per-room lists of all configured parameters accessible via handheld IR programmer for use with O&M documentation.
 - 2.78.6 Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
 - 2.78.7 Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors
- 2.79 Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations
 - 2.79.1 Set, copy/paste an entire project site of sensor time delays.
 - 2.79.2 Set, copy/paste an entire project site of sensor sensitivity settings.
 - 2.79.3 Search based on room name and text labels.
 - 2.79.4 Filter by product type (i.e. LMRC-212) to allow parameter set by product.
 - 2.79.5 Filter by parameter value to search for product with specific configurations
- 2.80 Network-wide firmware upgrading remotely via the BACnet/IP network
 - 2.80.1 Mass firmware update of entire rooms
 - 2.80.2 Mass firmware update of specifically selected rooms or areas
 - 2.80.3 Mass firmware upgrade of specific products

2.81 WattStopper Product Number: LMCS-100, LMCI-100

LMCP LIGHTING CONTROL PANELS

2.82 Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:

2.82.1 Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors

2.82.2 Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel

2.82.3 Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features

2.82.3.1 Removable, plug-in terminal blocks with connections for all low voltage terminations

2.82.3.2 Individual terminal block, override pushbutton, and LED status light for each relay

2.82.3.3 Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only

2.82.3.4 Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices

2.82.3.5 True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet

2.82.3.6 Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously

- 2.82.3.7 Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99
- 2.82.3.8 Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state
- 2.82.3.9 Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
- Electrical
- 2.82.3.9.1 30 amp ballast at 277V
- 2.82.3.9.2 20 amp ballast at 347V
- 2.82.3.9.3 20 amp tungsten at 120V
- 2.82.3.9.4 30 amp resistive at 347V
- 2.82.3.9.5 1.5 HP motor at 120V
- 2.82.3.9.6 14,000 amp short circuit current rating (SCCR) at 347V
- 2.82.3.9.7 Relays shall be specifically UL 20 listed for control of plug-loads
- Mechanical
- 2.82.3.9.8 Replaceable, ½" KO mounting with removable Class 2 wire harness
- 2.82.3.9.9 Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel
- 2.82.3.9.10 Dual line and load terminals each support two #14 - #12 solid or stranded conductors
- 2.82.3.9.11 Tested to 300,000 mechanical on/off cycles

- 2.83 Isolated low voltage contacts provide for true relay status feedback and pilot light indication

- 2.84 Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection
- 2.85 Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700
- 2.86 Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control
 - 2.86.1 Each panel shall include digital clock capability able to issue system wide automation commands to up to (11) eleven other panels for a total of (12) twelve networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups
 - 2.86.2 The clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes
 - 2.86.3 The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed
 - 2.86.4 The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
 - 2.86.4.1 Scheduled ON / OFF
 - 2.86.4.2 Manual ON / Scheduled OFF
 - 2.86.4.3 Astro ON / OFF (or Photo ON / OFF)
 - 2.86.4.4 Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
 - 2.86.5 The user interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
 - 2.86.6 The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years
 - 2.86.7 Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that

panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable

- 2.87 The lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection
- 2.88 The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet® protocol
 - 2.88.1 The panel shall have provision for an individual BACnet device ID and shall support the full 2^{22} range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network
 - 2.88.2 The panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second
 - 2.88.3 Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object present value property
 - 2.88.4 Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64
 - 2.88.5 The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode
 - 2.88.6 Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:
 - 2.88.6.1 Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays
 - 2.88.6.2 Binary value objects in the instance range of 1 – 99 (one per channel) for normal hours/after hours schedule control
 - 2.88.6.3 Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays

- 2.88.6.4 Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches
 - 2.88.7 The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel
 - 2.88.8 The BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (<http://www.bacnet.org/Addenda/Add-135-2010aa.pdf>)
 - 2.88.9 Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object
 - 2.88.10 Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196
- 2.89 WattStopper Product Number: LMCP8, LMCP24 or LMCP48

USER INTERFACE

- 2.90 Each lighting control panel system shall be supplied with at least (1) handheld configuration tool (LMCT-100). As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following panel-specific functions as a minimum:
- 2.90.1 Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
 - 2.90.2 Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.
 - 2.90.3 Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.

- 2.90.4 Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.
 - 2.90.5 Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.
 - 2.90.6 Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.
 - 2.90.7 An additional handheld IR remote may optionally be specified to be permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as determined by the end user's representative.
- 2.91 WattStopper Product Number: LMCT-100

EMERGENCY LIGHTING CONTROL DEVICES

- 2.92 Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
- 2.92.1 120/277 volts, 50/60 Hz, 20 amp ballast rating
 - 2.92.2 Push to test button
 - 2.92.3 Auxiliary contact for remote test or fire alarm system interface
- 2.93 WattStopper Product Numbers: ELCU-100, ELCU-200

PART 3 - EXECUTION

PRE-INSTALLATION MEETING

- 3.1 A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

- 3.1.1 Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
- 3.1.2 Review the specifications for low voltage control wiring and termination.
- 3.1.3 Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
- 3.1.4 Discuss requirements for integration with other trades

CONTRACTOR INSTALLATION AND SERVICES

- 3.2 Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs
- 3.3 Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufacturers with test results. Contractor to install any room to room network devices using manufacturer-supplied LM-MSTP network wire. Network wire substitution is not permitted and may result in loss of product warranty per DLM SEGMENT NETWORK section of specification. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings
- 3.4 Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, contractor shall test all devices to ensure proper communication
- 3.5 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings
 - 3.5.1 Adjust time delay so that controlled area remains lighted while occupied
- 3.6 Provide written or computer-generated documentation on the configuration of the system including room by room description including:
 - 3.6.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 - 3.6.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
 - 3.6.3 Load Parameters (e.g. blink warning, etc

- 3.7 Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner’s requirements. Provide a detailed report to the Architect / Owner of post start-up activity

FACTORY SERVICES

- 3.8 Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system
- 3.9 The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date
- 3.10 Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system

COMMISSIONING SUPPORT SERVICES

- 3.11 On this project, a commissioning agent will be hired to verify the installation and programming of all building systems, which includes the lighting control system. Manufacturer should include an extra day of technician’s time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent’s responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.
- 3.12 The commissioning agent shall work with the electrical contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer’s technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the contractor and manufacturer shall ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents

ACCEPTANCE TESTING SUPPORT SERVICES

- 3.13 On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician’s time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms. It will be the CLCATT’s responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task

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SECTION 26 24 16

PANEL BOARDS

PART 1 – GENERAL

- 1.1 Furnish and install branch circuit panel boards as specified herein and as indicated on the drawings. Submit manufacturers' data on all items.
- 1.2 Submit manufacturers' data on all panel boards and components including:
 - 1.2.1 Enclosures and covers
 - 1.2.2 Breakers
 - 1.2.3 Surge Protective Device (SPD) equipment
 - 1.2.4 Incident energy level calculations
 - 1.2.5 Common submittal mistakes which will result in the submittals being rejected:
 - 1.2.5.1 Not arranging the circuit breakers in panels to match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.
 - 1.2.5.2 Not including all items listed in the above itemized description.
 - 1.2.5.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.2.5.4 Not including actual manufacturer's catalog information of proposed products.
 - 1.2.5.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 The interrupting rating of circuit breakers shall be 10,000 amps for the 120/208 system and 14,000 amp for 277/480 volt systems. Refer to drawings for higher interrupting rating requirements. All components and equipment enclosures shall be manufactured by the same manufacturer. Circuit breakers shall be permitted to be series rated to limit the available fault current to no more than the above ratings.

- 2.2 All panels shall be fully bussed. Recessed panel enclosures shall be a maximum of 20" wide and 5-3/4" deep for all panels 600 amp rated and less.
- 2.3 All busses shall be tin-plated aluminum and shall be located in the rear of the panelboard cabinet. Individual circuit breakers shall be bolt on type and removable from the cabinet without disturbing the bussing in any way. All panel boards shall contain ground busses.
- 2.4 Panel covers shall be door in door style, with one lock. Door lock shall allow access to breakers only. Access to wireways without removal of cover shall be permitted by (non removable) screws behind the locked door. Panel cover shall be provided with full length piano hinge. All locks for all panels provided in this project shall be keyed alike.
- 2.5 Each panel shall have a two-column circuit index card set under glass or glass equivalent on the inside of the door. Each circuit shall be identified as to use and room or area. Areas shall be designated by room numbers. Room numbers shown on the drawings may change and contractor shall verify final room numbers with the architect prior to project completion.
- 2.6 Tandem mounted or wafer type breakers are not acceptable.
- 2.7 Multiple breakers shall have one common trip handle or be internally connected. Handle ties are not acceptable.
- 2.8 Breaker arrangements shown in the drawings shall be maintained. The circuit breakers in panels must match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.
- 2.9 Where conductor sizes exceed the standard breaker lug wire range, or where multiple conductors per phase are required, the panelboard manufacturer shall provide the breaker with suitable lugs for terminating the specified conductors.
- 2.10 Acceptable manufacturers are Square D, Eaton, Siemens or General Electric.
- 2.11 Equipment manufactured by any other manufacturers not specifically listed in Section 2.10 are not considered equal, or approved for use on this project.

Surge Protective Device (SPD)

- 2.12 Surge Protective Device (SPD) panelboards, shall be provided with an integrated circuit breaker panelboard and parallel connected suppression / filter system in a single enclosure. The SPD panelboard shall meet the following parameters: IEEE C62.41.1, IEEE C62.41.2, IEEE C62.45, UL 1283 and the UL 1449, Third Edition, effective September 29, 2009.
- 2.13 The panelboard shall be UL 67 Listed and the SPD shall be UL 1449 labeled as Type 1 or Type 2 or as Type 4 intended for Type 1 or Type 2 applications. SPD shall be factory installed integral to the panel board.

2.14 The SPD panelboard shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.

2.15 SPD shall meet or exceed the following criteria:

2.15.1 For standard areas supply SPD having 100kA per phase surge current capacity. For mountain and desert areas (areas with over 5 lightning strikes per year), SPD shall have a per phase surge current capacity of 200kA.

2.15.2 UL 1449 – Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>L-L</u>	<u>MCOV</u>
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

2.15.3 SPD shall be UL labeled with 100kA Short Circuit Current Rating (SCCR).

2.16 UL 1449 - Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>L-L</u>	<u>MCOV</u>
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

2.17 SPD shall be UL labeled with a minimum 100kVA short circuit rated (SCCR).

2.18 UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

<u>System Voltage</u>	<u>Allowable System Voltage Fluctuation (%)</u>	<u>MCOV</u>
208Y/120	25%	150V
480Y/277	15%	320V

2.19 SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz. No filtering is required for a 100kA SPD.

2.20 Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.

2.21 Type 4 SPD shall include a serviceable, replaceable module.

2.22 SPD shall be equipped with the following diagnostics:

2.22.1 Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.

2.22.2 No other test equipment shall be required for SPD monitoring or testing before or after installation.

- 2.23 SPD shall have a response time no greater than 1/2 nanosecond
- 2.24 SPD shall have a 10 year warranty
- 2.25 The SPD panelboard shall have removable interior
- 2.26 The SPD panelboard main bus shall be aluminum and rated for the load current required
- 2.27 The SPD panelboard shall include a 200% rated neutral assembly with copper neutral bus
- 2.28 The unit shall be provided with a safety ground bus

(SPD) Quality Assurance

- 2.29 Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing transient voltage surge suppressors.
- 2.30 Manufacturer shall be ISO 9001 or 9002 certified.
- 2.31 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- 2.32 The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

PART 3 – EXECUTION

- 3.1 Painting of panelboard covers in finished areas shall be done by the general contractor.
- 3.2 Provide a spare 3/4" conduit stubbed to an accessible area for each of every three (3) spares or spaces provided in recessed panel boards.
- 3.3 All lugs shall be torque tested in the presence of the inspector of record.

Arc Flash and Shock Hazard

- 3.4 The Contractor is to provide, and submit to the engineer for approval, incident energy level calculations as determined using the methodologies described in NFPA 70E or IEEE standard 1584-2002.
 - 3.4.1 **All studies shall be performed by “Emerson Electric” (858) 695-9551, MTA (858) 472-0193, or Terra Power Solutions (858) 380-8170. Studies performed by manufactures or other engineering or testing companies must submit qualifications for approval by Johnson Consulting Engineers, 7 days prior to bid for this project.**

- 3.5 A warning label, as specified in the above standard, shall be placed on each switchboard, panelboard, and safety switch indicating the incident energy levels on the equipment to warn qualified personnel in accordance with NFPA 70E, section 110.16 Labels shall be laminated white micarta with black lettering on each. Letters shall be no less than 3/8" high.
- 3.6 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department
- 3.7 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

END OF SECTION

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SECTION 26 27 26
SWITCHES AND RECEPTACLES

PART 1 – GENERAL

- 1.1 Furnish and install all wiring devices as shown on drawings and as herein specified. Unless otherwise noted, device and plate numbers shown are Hubbell and shall be considered the minimum standard acceptable. Other acceptable manufacturers are Pass and Seymour, Leviton, General Electric and Bryant.
- 1.2 Submit manufacturers' data on all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not correctly indicating ampacity rating of proposed devices.
 - 1.3.2 Not including all items listed in the above itemized description.
 - 1.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.4 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 All switches shall be of the quiet mechanical type, Specification Grade, 20 amp, 120/277 volt AC as follows:

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS & SEYMOUR</u>
Single Pole	CS120	CS1202	CS20AC1
Two Pole	CS1222	CS2202	CSB20AC2
Three-way	CS320	CS3202	CS20AC3
Key Switch	HBL1221L	1221-2L	PS20AC1-L
- 2.2 All switches shall have the "on" and the "off" position indicated on the handle. If switches of higher ampere ratings are required, they shall be of similar type and quality as those shown above. Groups of switches shown at one location shall be installed under a single plate up to a maximum of six where more than six switches are shown coordinate arrangement with the Architect.
- 2.3 Dimmer switches for incandescent lamp loads shall be square-law type, slide control dimmer with OFF position, Lutron or Hubbell "Nova-T" Series NT-600 (0-500 watt load), NT-1000 (501-900 watt load), NT-1500 (901-1500 watt load), or equal (no known equal).

- 2.4 All convenience receptacles and special outlets throughout shall be grounding type. Convenience receptacles shall be side wired, parallel slot, two pole, three wire, 20 amp as follows:

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS & SEYMOUR</u>
Duplex	5352	5362	PS5362
GFCI	GFR5362	7899	2097
Isolated Ground	IG5362	5362IG	IG6300
Tamper Proof		8300SG	TR63H

- 2.5 All safety or tamper proof receptacles shall have no exposed external current carrying metal parts and shall have integral wiring leads suitable for two or three wire installations.
- 2.6 Special receptacles shall be as noted on the drawings.
- 2.7 Weatherproof plates shall be designed to meet CEC Article 410-57, wet location listed with cover "open." Where weatherproof receptacles have been identified to be provided with locking covers, the cover shall be as manufactured by Pass & Seymour #4600-8 or Cole Lighting 310 Series. Rough-in requirements vary between manufacturers. Contractor to field verify requirements prior to installation.
- 2.8 All plates throughout shall be stainless steel. Where wiring devices are installed in concrete block walls, provide oversized 3-1/2" x 5" coverplates.
- 2.9 All devices shall be white unless otherwise noted or a special purpose outlet.
- 2.10 Unless where specifically detailed on the drawings, floor boxes shall be PVC suitable for concrete poured floors of minimum 3-1/2" depth, with a modular design to gang two or three sections together.
- 2.10.1 Carlon #E976 series or approved equal
- 2.10.2 Provide brass cover with brass carpet flange unless otherwise detailed.

PART 3 – EXECUTION

- 3.1 Switches for room lighting shall be located no more than 12" center line from door jamb at plus 48" center line above finished floor or +46" to top of devices where located over casework, reference CBC Figure 11B-5D.
- 3.2 All receptacles shall be mounted at plus 18" to center line above finished floor unless noted or shown otherwise. All receptacles shall be installed with the ground pin up, at the top of the receptacle to comply with IEEE 602-1986.
- 3.3 Furnish and install wall plates for all wiring devices, and outlet boxes, including special outlets, sound, communication, signal, and telephone outlets, etc. as required. All cover plates shall be appropriate for type of device.

END OF SECTION

SECTION 26 28 16

DISCONNECTS

PART 1 – GENERAL

- 1.1 Furnish and install all disconnect switches as shown on the drawings and as required by the CEC.
- 1.2 Submit manufacturers' data for all disconnects and fuses.
 - 1.2.1 Disconnects
 - 1.2.2 Fuses
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
 - 1.3.1 Not including all items listed in the above itemized description.
 - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 Acceptable manufacturers shall be Square D, Cutler Hammer, Siemens or General Electric.
- 2.2 Equipment manufactured by any other manufacturers not specifically listed in Section 2.1 are not considered equal, or approved for use on this project.
- 2.3 All switches shall be heavy-duty type, externally operated, quick-make, quick-break, rated 600 volts or 240 volts as required, with the number of poles and ampacity as noted. All switches for motors shall be HP rated. Switches shall have NEMA-Type 1 enclosures, except switches located where exposed to outdoor conditions shall have NEMA Type 3R enclosure. Switches generally shall be fused except where noted to be non-fused on the drawings.
- 2.4 Where fuses are indicated, fuses shall be Bussman or Littlefuse (no known equal). Fuses shall be current limiting type with time delay characteristics to suit the equipment served.

PART 3 – EXECUTION

- 3.1 Mount all switches to structure or U-channel support. U-channel supports shall be cleaned and painted to prevent rust.
- 3.2 Switches shall be accessible with proper clearances in front per CEC 110-16.
- 3.3 All lugs shall be torque tested in the presence of the inspector of record.
- 3.4 Arc Flash and Shock Hazard
 - 3.4.1 The contractor is to provide, and submit to the engineer for approval, incident energy level calculations as determined using the methodologies described in NFPA 70E or IEEE standard 1584-2002.
 - 3.4.2 A warning label, as specified in the above standard, shall be placed on each switchboard, panelboard, and safety switch indicating the incident energy levels on the equipment to warn qualified personnel in accordance with NFPA 70E, section 110.16 Labels shall be laminated white micarta with black lettering on each. Letters shall be no less than 3/8" high.
 - 3.4.3 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.
 - 3.4.4 The design goal is to minimize the incident energy to which a maintenance employee may be exposed and in no case more than 8 cal./cm².

END OF SECTION

SECTION 26 51 14
LED LIGHTING FIXTURES AND LAMPS

PART 1 – GENERAL

- 1.1 Furnish and install all lighting fixtures with lamps as specified and as shown on the drawings. Fixtures shall be complete including canopies, hanger, diffusers, ballasts, etc.
- 1.2 Submit manufacturer's data for each fixture type including the following:
 - 1.2.1 Lighting fixture catalog data and photometry.
 - 1.2.2 Lamp catalog data for each fixture type.
 - 1.2.3 Driver catalog data for each fixture type.
 - 1.2.4 Fixture warranty.
- 1.3 **Common submittal mistakes which will result in the submittal being rejected:**
 - 1.3.1 Not including lamp and driver information for each fixture type.
 - 1.3.2 Not including all items listed in the above itemized description.
 - 1.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
 - 1.3.4 Not including actual manufacturer's catalog information of proposed products.
 - 1.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PRODUCT SUBSTITUTION

- 1.4 All substitutions or alternate fixtures to those indicated on the project fixture schedule shall be submitted for approval (7) business days prior to the project bid date. Approvals when accepted will be issued in the form of an addendum. No consideration for substitutions will be provided after the award of the contract.
 - 1.4.1 The substitution request must include a statement indicating the difference in price of both the specified and alternate product, both contractor and list price. The substitution request must include a comparison of the total fixture wattage, total fixture lumens, fixture efficiency and warranty comparison.
 - 1.4.2 When proposing to substitute lighting fixture and/or fixture retrofit, a point by point photometric calculation of a typical application as used in this project shall be included. A calculation of the specified and the proposed alternate shall be included.

PART 2 – PRODUCTS

- 2.1 All catalog numbers are given for manufacturer's identification and shall not relieve Contractor from responsibility of full conformance to all applicable written description requirements governing material and fabrication, either in the general or specific sections. Where catalog numbers are indicated as modified, no modification will be required if the standard unit fully conforms to descriptive requirements in the Specifications and matches specified ceiling.
- 2.2 All fixtures of the same type shall be of one manufacturer and of identical finish and appearance. All fixtures and component parts shall bear the UL label.
- 2.3 All steel parts shall be phosphate treated in multistage power spray system for corrosion resistance and paint adhesion. Final finish shall be electrostatically applied baked white enamel of not less than 87 pct. reflectance on reflecting surfaces.
- 2.4 Each fixture shall have a continuous light-seal gasket seated in such manner as to prevent any light leak through any portion or around any edge of the trim frame.
- 2.5 Diffusers shall be framed in a hinged, continuous assembly. Diffuser frame latches shall be spring-loaded or cam-operated.
- 2.6 All recessed fixtures shall be provided with frames appropriate for the type of ceiling involved. No fixtures shall be ordered until the ceiling construction has been verified by the Contractor.

MINIMUM LUMINARY REQUIREMENTS

- 2.7 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.
- 2.8 Recessed Fixtures: Comply with NEMA LE 4.
- 2.9 CRI of **minimum 80 CCT of 4100 K.**
- 2.10 Rated lamp life of 50,000 hours minimum.
- 2.11 Lamps dimmable from 100 percent to 0 percent of maximum light output.
- 2.12 Nominal Operating Voltage: **120 V / 277 V ac**

PART 3 – EXECUTION

- 3.1 All lighting fixtures shall be supported as follows:
 - 3.1.1 From the outlet box by means of a metal strap where its weight is less than five pounds.
 - 3.1.2 From its outlet box by means of a hickey or other threaded connection where its weight is from five to fifty pounds.

- 3.1.3 Directly from the structural slab or joists where its weight exceeds fifty pounds.
- 3.1.4 Lighting fixtures shall be supported independent of the ceiling system or additional ceiling support must be added to carry the weight of the lighting fixtures. Recessed lighting fixtures supported from ceiling grid tees shall be furnished with hold down clips in conformance with CEC 410 - 16, spring clips will not be permitted. All fixtures which the manufacturer has not provided UL approved clips, must be attached to the fixture and ceiling grid by metal screws.
- 3.2 Furnish and install supplementary blocking and support as required to support fixture from structural members. Contractor shall submit proposed blocking method for all suspended lighting fixtures for approval prior to rough in.
- 3.3 Suspended and/or pendant mounted fixtures shall be provided with four aircraft safety cables extending in opposite directions, attached to the fixture, and supported from a structural member. The contractor shall submit proposed fixture mounting and aircraft cable attachment methods for approval prior to fixture rough in.
- 3.4 Class 1 wiring to the fixture must be installed either conduit or type MC-PCS cabling no open wiring shall be permitted.
- 3.5 Chain suspension may be used only where specifically permitted on the drawings. Chain shall be heavy duty, nickel or cadmium plated, suitable for weight of specific fixture.
- 3.6 Shop drawings shall be furnished for each fixture type. Catalog cuts, illustrating conformance with specifications, will be acceptable for standard units. Shop drawings shall indicate materials, assembly, finish and dimensions.
- 3.7 Photometric data shall be furnished for any fixture substituted for those listed on the schedule.
- 3.8 Any driver which produces a greater than normal amount of noise shall be replaced by the contractor. Normal will be determined by the level of sound produced by other similar fixtures operating in the area.

END OF SECTION

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SECTION 26 90 90

TESTING

PART 1 – GENERAL

- 1.1 Upon completion of the electrical work, the entire installation shall be tested by the Contractor, and demonstrated to be operating satisfactorily to the Architect, Engineer, Inspector and Owner.
- 1.2 All testing and corrections shall be made prior to demonstration of operation to the Architect, Engineer, Inspector and Owner.
- 1.3 In addition to the demonstration of operation, the Contractor is also required to review the content and quality of instructions provided on items demonstrated with the Architect, Engineer, Inspector and Owner.

PART 2 – EXECUTION

- 2.1 Wiring shall be tested for continuity, short circuits and/or accidental grounds. All systems shall be entirely free from “grounds,” “short circuits,” and any or all defects.
- 2.2 Motors shall be operating in proper rotations, and control devices functioning properly. Check all motor controllers to determine that properly sized overload devices are installed, and all other electrical equipment for proper operation.
- 2.3 Tests and adjustments shall be made prior to acceptance of the electrical installation by the Architect, and a certificate of inspection and acceptance of the electrical installation by local inspection authorities shall be provided.
- 2.4 All equipment or wiring provided which tests prove to be defective or operating improperly shall be corrected or replaced promptly, at no additional cost to the Owner.
- 2.5 Test all motor and feeder circuits with a “megger” tester to determine that insulation values conform to Section 110-20, California Electrical Code (CED). Test reports must be submitted and approved by the engineer before final acceptance.
- 2.6 Test all grounding electrode connections to assure a resistance of no more than 10 ohms is achieved. Augment grounding until the ohmic value stated above is achieved. Provide certified test results to the Architect, Engineer and Inspector.

END OF SECTION

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SECTION 27 01 00

COMMUNICATIONS GENERAL PROVISIONS

ARTICLE 1 - SUMMARY

- 1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.
- 1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

END OF SECTION

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SECTION 27 10 00
VOICE / DATA / IP INTERCOM-CLOCK INFRASTRUCTURE

PART 1 – GENERAL

- 1.1 Include all labor, equipment and materials necessary for providing a complete networking infrastructure system as described herein and/or as indicated on the drawings.
- 1.2 Related specification sections:
 - 1.2.1 Section 26 01 00 - General Provisions
 - 1.2.2 Section 26 05 33 - Conduit and Fittings
 - 1.2.3 Section 26 05 19 - Conductors
 - 1.2.4 Section 26 05 34 – Outlet and Junction Boxes
- 1.3 Approved Products and minimum contractor certifications
 - 1.3.1 All components shall be manufactured by one of approved manufacturers, the installing contractor must have the accompanying certification from the product manufacturer for installation of a “Warranted System” as required by each manufacturer and as indicated in these specifications. **Acceptable manufacturers are:**
 - 1.3.2 **TYCO**
 - 1.3.2.1 Installing contractor must be **Tyco ND&I** certified to install this system.
 - 1.3.2.2 Pursuant to Public Contract Code Section 3400(b), the materials, products, things or services in this Specifications section are designated by specific brand name or trade name for the purposes of matching other products in existing District projects to establish District-wide uniform, complete and compatible systems in order to facilitate the most technologically competitive and feasible education for school children in the District. A copy of the District findings and Resolution in accordance with Public Contract Code Section 3400(b) is available upon written request at the District.
 - 1.3.3 Systems or components as manufactured by any other manufacturers which, are not specifically listed in 1.3.2 are **not** approved for use on this project. Specified system warranties are to be established between the component manufacturers and the owner, warranties between the cable manufacturer or installing contractor and the owner are not considered equal.

- 1.3.4 Installing contractor qualifications: Firms and their personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope. The contractor must have a full service office able to respond to emergency callouts during the warranty period. The contractor must also provide complete installation of all wiring and devices or equipment. Subcontracts with electrical contractors or other warranted or non-warranted contractors for supervised installation of any part of this system are not approved. All conduit and standard back boxes will be furnished and installed by the electrical contractor. Specialty boxes will be furnished by the equipment supplier and installed by the electrical contractor.
- 1.3.5 Equipment qualifications: It is the intent of these specifications that each bidder provides all hardware, components and installation services that are necessary to ensure a fully operational Category-6 wiring system including warranties, proposed in the EIA/TIA Category-6 and the ISO Class E drafts.
- 1.3.6 **Warranty: Warranty shall be a full "Performance Warranty" installed by a "Certified Contractor" as specified by one of the approved manufacturer's A "Component Warranty" will not be considered equal.** All components, labor, and 'Link Performance Criteria' shall be warranted by one of the approved manufacturers. Warranty shall be to the customer for 25-years (some warranty programs may be greater, this is a minimum requirement) after Customer acceptance and sign-off of the completed system. **The contractor must provide documentation from one of the approved manufacturers as indicated in Section 1.3.2 indicating their qualifications for installation of this system in compliance with the manufacturers warranty requirements as a warranted contractor.**
- 1.4 In order to ensure project cohesion, a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all labor; cabling; equipment; supplies; materials, and training. The Contractor will perform all operations necessary for the "TURNKEY" and fully completed installation in accordance with the specifications herein. As such, the successful contractor must be factory trained on all aspects of system hardware. The successful Contractor shall be a California licensed C7 or C10 premise wiring contractor as defined in this specification. Subcontractors may not be utilized in the implementation of the plant wiring installation or certification process. The contractor shall provide a licensed, qualified electrical contractor for installation of all conduits, outlet and junction boxes, trenching and pull box installations.
- 1.5 The drawings indicate a schematic routing of cables above ceilings. The Contractor shall field-verify the most appropriate routing of all above-ceiling cable prior to bid. Where cables penetrate through walls a conduit sleeve shall be provided. **Where cables pass through fire rated walls, the conduit sleeve shall be sealed to maintain the rating of the wall assembly.**

- 1.6 Phase I Submittal shall be made **within (20) working days** after the award of the contract by the District. This submittal shall include the following:
- 1.6.1 Complete bills of quantities, including all materials, components, devices, and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed:
 - 1.6.1.1 Description and quantity of each item.
 - 1.6.1.2 Manufacturer's Name and Model Number.
 - 1.6.1.3 Manufacturer's Specification Sheet.
 - 1.6.2 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.
- 1.7 Phase II submittal shall be provided **within (20) working days** after the approval of the Phase I submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered and drawn on a CAD System. Each submission shall include 'D' or 'E' size print copies to match the contract drawings, and (1) Phase II submittals drawings shall include the following.
- 1.7.1 MDF or IDF equipment or rack elevations will be required to be provided including, cable routing and position of all components.
 - 1.7.2 Provide labeling plan which identifies the proposed scheme for identifying all components including Racks, patch panels (fiber and copper), ports and cables (fiber and copper).
- 1.8 The contractor shall make a **written** request directly to Johnson Consulting Engineers for electronic drawing files. As a part of the written request, please include the following information:
- 1.8.1 Clearly indicate each drawing sheet needed (i.e., E1.1, E2.1, etc.).
 - 1.8.2 Identify the name, phone number, mailing address and e-mail address of the person to receive the files.
 - 1.8.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.
 - 1.8.4 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, **will not be made available to the contractor.**
 - 1.8.5 Files will only be provided in the AutoCAD format in which they were created (i.e., version 14 or version 2000i).

- 1.8.6 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The contractor shall be completely responsible for requesting the files in time for their use.
- 1.8.7 CAD files will be made available via e-mail or on disk, depending on the quantity of files requested. The contractor requesting the files will be required to pay \$50.00 per drawing plan, or \$300.00 maximum, whichever is less.

PART 2 - PRODUCTS

- 2.1 Equipment racks have been detailed on the drawings and additional component information requirements have been described in the MDF or IDF products sections. The following is a list of approved manufacturers for each type of rack system.
 - 2.1.1 Alternate equipment manufacturers other than those indicated will not be reviewed or approved for use on this project.
 - 2.1.2 **(Open Frame)** shall be manufactured by B-Line, Chatsworth CPI or Middle Atlantic. Reference drawing details and specifications for complete requirements.

Main Distribution Frame (Existing)

- 2.1 The Main Distribution Frame shall be the central wiring and equipment location for the infrastructure systems. The contractor shall include the following items at this location.
 - 2.1.1 **Data Infrastructure Fiber Optic Feed Cables** - Fiber optic termination equipment (rack mounted), including all associated installation hardware. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements. All fiber feed cables shall be terminated in a single fiber optic patch panel up to 144 strands. Additional strands shall be terminated in the largest size required to contain the remaining fibers. Data fiber optic feed patch panels shall be terminated separately from the feed cables for the voice switch.
 - 2.1.2 MDF equipment mounting rack is existing. Provide all accessories whether shown on drawings or in specifications.
 - 2.1.3 Additional items required for the MDF are as follows:
 - 2.1.3.1 Fiber optic patch cord optical fibers shall be 50/125um micron laser-optimized multimode optical glass for dual operation at 850nm and 1300nm wave length. Fiber optic patch cords shall be terminated with duplex SC connectors on both ends with ceramic ferrules. Each IDF closet requires (2) patch cords for connection to the Data

Infrastructure MDF Rack. All patch cords shall be Aqua (Lt.Blue) in color. Patch cords shall be 10 feet (3-meters) in length.

2.1.3.2 Provide all other items as detailed on the drawings.

Intermediate Distribution Frame

2.2 The Intermediate Distribution Frame shall be a secondary wiring and equipment location for the data networking system. The contractor shall include the following items at this location.

- 2.2.1 Provide 8'-0" high x 3/4" thick, as detailed on drawings, flame resistant plywood mounting backboard, painted with fire resistant paint white or color to match. Contractor shall provide minimum one side finish grade plywood. **Backboard shall be mounted with finish side out, regardless of location of fire rating stamp. Once stamp has been confirmed by the IOR, the stamps can be painted over. Do not leave any portion of the backboard unpainted.**
- 2.2.2 Fiber optic termination equipment (rack mounted), including all associated installation hardware for fiber feed cables. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future installation. All fiber optic patch panels shall be provided fully loaded with SC bulkheads. Patch panel shall be 24-port patch panel minimum.
- 2.2.3 Category-6 TYCO ACO type Patch Panel (rack mounted), with RJ45 style connectors for terminating all twisted pair cable from each Voice/Data/IP Page outlet served from this location. The patch panels shall be installed as a fully loaded kit, complete with edge connectors, housings, panel assembly and connector faceplates. Provide a minimum of 25% spare capacity for future wiring requirements. All patch panels shall be 16 or 32 port panel assemblies. Provide cable support bars at the rear of each patch panel TYCO #557548-1. Terminate the data cables from the audio-visual systems in the same patch panels.
- 2.2.4 Provide 24-port, RJ45, single pair per port, voice patch panel for the extension of the voice feed cable from the termination blocks on the backboard to the equipment rack. Provide 25-Pair tail from the punch blocks to the equipment rack. See the drawing details for additional requirements. All pairs shall be tested for continuity and polarity back to the Campus MDF Room.
- 2.2.5 Provide equipment mounting rack or enclosure as detailed in the drawings. Provide ladder rack bracing at top of rack back to wall and seismic bolting to floor and wall as shown on detail drawings. Provide all accessories whether shown on drawings or in specifications. Rack shall be furnished with the following accessories:

- 2.2.5.1 Provide (1) adjustable full depth vented shelf for each four post Quadrarack.
- 2.2.5.2 Provide full length vertical wire managers, CPI Part #30161-703, on each side of each rack section, or between racks for full height four-post Quadraracks.
- 2.2.5.3 (1) Grounding kit, connect grounding conductor to nearest ground buss bar. CPI Part #41016-001 or equal.
- 2.2.5.4 Provide horizontal wire managers between each patch panel. Provide (2) spare managers per rack section. Horizontal managers must be a minimum of (2) RMU in height. CPI Part # 12542-x19 or equal.
- 2.2.5.5 (2) horizontal rack mounted surge arrest style power strips "APC" #NET9RM with guarded master on-off switch where shown on drawings. Provide with minimum 15-foot cord.
- 2.2.5.6 Provide an uninterruptible power supply, 120 volt, rack-mounted at the IDF location. UPS shall be provided with backplane configuration containing;

Output receptacles (minimum)

- 2.2.5.7 Backplane total - (6) NEMA 5-15R and (2) NEMA 5-20R receptacles, 120 volt non-locking.

Input receptacle (minimum)

- 2.2.5.8 (1) 30-amp, 120 volt, locking, NEMA L5-30P plug installed on 8'-0" power cord.
- 2.2.5.9 APC" Smart-UPS Model #SMX2200RMLV2U with Optional Network Card Model #AP9631 with environmental monitoring capability

2.2.6 Additional items required at each IDF closet are as follows:

- 2.2.6.1 Fiber optic patch cord optical fibers shall be 50/125um micron laser-optimized multimode optical glass for dual operation at 850nm and 1300nm wave length. Fiber optic patch cords shall be terminated with duplex SC connectors on both ends with ceramic ferrules. Each IDF closet requires (2) patch cords for connection to the Data Infrastructure MDF Rack. All patch cords shall be Aqua (Lt.Blue) in color. Patch cords shall be 10 feet (3-meters) in length.
- 2.2.6.2 Provide (white) Category-6 (patch panel end) patch cords with pre-molded boot, provide quantity equal to 50% of the total voice/data

cable drops or ports provided. Verify with Customer all ports which will be activated. All patch cords to be installed by contractor. Allow for 15% of total copper patch cords required to be (7) feet in length, and all remaining patch cords shall be (4) feet in length. Patch cords shall be in compliance with the manufacturer's "Link" warranty requirements.

2.2.6.3 Provide (color per detail drawings and station insert color) Category-6 (patch panel end) patch cords with pre-molded boot, provide quantity equal to 100% of the total IP Clock/Speakers, Wireless Access Points, LCD Projector/Audio-Visual and IP camera cable drops or ports provided. Verify with Customer all ports which will be activated. All patch cords to be installed by contractor. All patch cords shall be (4) feet in length, unless otherwise shown in the drawings or specifications. Patch cords shall be in compliance with the manufacturer's "Link" warranty requirements.

2.2.6.4 Provide (blue) Category-6 (workstation end) patch cords with pre-molded boot, provide quantity equal to 50% of the total voice/data cable drops or ports provided. Verify with Customer all ports which will be activated. All patch cords to be installed by contractor. Provide for 10% of total copper patch cords required to be (15) feet in length and all remaining patch cords shall be (10) feet in length. Patch cords shall be in compliance with the manufacturer's "Link" warranty requirements.

2.2.6.5 Provide (color per detail drawings and station insert color) Category-6 (workstation end) patch cords with pre-molded boot, provide quantity equal to 100% of the total Wireless Access Points, LCD Projector/Audio-Visual and IP camera cable drops or ports provided. Verify with Customer all ports which will be activated. All patch cords to be installed by Contractor. All patch cords shall be (2) feet in length, unless otherwise shown in the drawings or specifications. Patch cords shall be in compliance with the manufacturer's "Link" warranty requirements. Patch cords for the IP Clock/Speakers is shown in the paging section of this specification.

2.2.6.6 Provide all other items as detailed on the drawings.

2.3 **Campus Indoor/Outdoor Fiber Optic Feed Cable**

2.3.1 Provide one continuous fiber optic cable routed from the Main Distribution Frame fiber patch panel to each Intermediate Distribution Frame fiber patch panel, and/or other locations as shown on the drawings.

2.3.2 Fiber optic cable shall be rated for indoor/outdoor and riser applications. Construction shall consist of; all dielectric, indoor/outdoor Riser Rated Tight

Buffer Style, flame retardant PVC or PE jacket, rated OFNR, Outer and Inner Layer of Dielectric Strength Yarns with central member constructed of Dielectric Strength Yarns, dry water-blocking compound, and blank fillers as required. Fiber shall be small form factor type fiber for use in existing conduit and pathways and shall not exceed an Overall Outside Diameter (OD) of .350". Central tube or loose tube type fiber will not be considered equal

2.3.3 Provide 24-strand multimode fiber feed cable, as shown on the riser diagram, to the IDF location from the existing MDF Room on campus. Feed cables shall be clearly defined and labeled per the detail drawings. Additional labeling on the fiber optic patch panel is required to identify which system the feed cable is servicing.

2.3.4 Cable shall contain one or all types of fibers listed below:

2.3.4.1 Provide Multimode 50/125 micron fiber optic glass, (minimum OM4 laser-optimized grade) for dual mode operation at 850 nm and 1300 nm wave lengths. Maximum attenuation at 3.0dB/km @ 850nm and 1.0dB/km @ 1310nm. Quantity of fibers as per detail drawings. Minimum gigabit Ethernet distance guarantee of 1100 meters @ 850nm and 600 meters @ 1300nm. Minimum 10 gigabit Ethernet distance guarantee of 550 meters @ 850nm/1300nm. Fiber shall be ISO-TIA Standard OM4 rated.

2.3.4.2 Refer to drawings for cable types required. Refer to acceptable cables section for additional information and approved manufacturers.

2.3.5 Each fiber optic cable shall contain the quantity of strands of optical fibers as detailed on the drawings. **A pull string shall be placed with all fiber cable at the time of installation. Outdoor rated fiber runs in excess of 150 feet shall be provided with a minimum 1/4" pull rope for future access. All empty and spare site conduits shall be provided with a minimum 1/4" pull rope for future access.**

2.3.6 All fibers in a multi-fiber cable shall be fully operational within the required performance characteristics. If any individual fiber does not meet the minimum standards, the entire cable must be replaced, end to end, including connectors, without any additional expense to the customer.

2.3.7 Acceptable cables shall be:

TYCO — Cat 6

**Above glass types are an example of product names per manufacturer.
Confirm requirements for indoor/outdoor fiber cable with riser drawings and**

site plans. Part numbers for composite style cable will vary greatly. Confirm part numbers with manufacturer.

2.4 Voice/Data/IP Page Station Cable

2.4.1 Provide one Category-6, 4-pair, unshielded twisted pair (UTP) cable from the nearest IDF to each RJ45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables. All UTP cable shall be blue in color. Contractor shall be responsible for providing the correct color per the drawings.

2.4.2 Category 6 cables shall be copper wire, individually insulated and color coded.

2.4.3 The cables shall be UL or ETL rated and UL verified in compliance with proposed Category-6.

2.4.4 The cables shall be UL or ETL rated and UL verified in compliance with proposed Category-6.

TYCO —Category-6

2.5 IDF to MDF Voice Feed Cables

2.5.1 Provide multi-pair UTP Category 3 cable from each IDF to the MDF as indicated on drawings. Cable must be 24 AWG, 22 AWG will not be approved as an acceptable equal.

2.5.2 For voice feed cables, terminate all pairs on 66-type termination blocks in the IDF closet and on 110-Type termination blocks at the MDF Room. Follow standard voice color codes for termination.

2.5.3 All voice feed cables will be tagged on the incoming cable with a typed permanent label with information as to its origin, house pair count, and cable destination. All 66-type blocks shall be labeled with type written labels that fit between the termination blocks (e.g., clear snap-on covers, adhesive labels and holders). Pairs shall be identified a minimum of every 5 pair on the block.

2.5.4 Provide distribution rings for the 110-type blocks mounted at the MDF location.

2.5.5 In the IDF closet, the voice feed cable shall be spliced through directly to the patch panel in the equipment rack. See the drawing details for additional requirements.

2.5.6 Ground and bond feed cables at one end of cable to aluminum shield with approved “bullet bond” type ground lug and #10 AWG green ground wire. Connect ground wire to closet ground buss bar.

2.5.7 Acceptable manufacturers shall be: General Cable or Essex #ARMM type Series for indoor riser cable applications.

2.5.8 Acceptable manufacturers shall be General Cable #ANMW type or Essex Sealpic series for outdoor cable applications.

Maximum cable outside diameters shall be as follows:

25 Pair–	.61 in.
50 Pair–	.77 in.
100 Pair –	.99 in.
200 Pair–	1.29 in.

2.5.9 Data contractor is responsible for providing the telephone equipment vendor with detailed feed cable documentation as well as identifying all of the physical cable in the MDF and IDF locations. **Contractor shall have all installation, termination and documentation of voice feed cable completed, and released to the telephone equipment vendor, a minimum of three weeks prior to the cut-over date set by the District.**

2.5.10 Data contractor is responsible for testing port connectivity from the punch blocks in the IDF closets to the main feed cable blocks in the MDF Room. Test all pairs for continuity and polarity. **All testing must be completed a minimum of three weeks prior to the cut-over date set by the District.**

2.6 Voice/Data/IP Speaker Outlets

2.6.1 Unshielded twisted pair data outlets shall be an RJ45 Enhanced performance type 8-position / 8 conductor modular jacks, single port, dual port, four port or quantity as indicated on the floor plans. All outlets shall be wired in an EIA/TIA 568B configuration. All “ACO” type outlets shall comply with Category-6 performance requirements and all “110-Connect” type outlet inserts shall comply with Augmented Category-6 performance requirements.

2.6.2 Provide “ACO” edge connector type installation kits and inserts for all voice/data locations, with the exception of the wall mount telephone outlets. The data locations that are routed to the IP Cameras, IP Clock/Speakers, Wireless Access Points and LCD/Audio-Visual data locations shall be provided with 110-Connect modular termination inserts and faceplates.

2.6.3 All fax/modem locations shall be provided as data outlets. Requirements shall be the same as a single port data outlet as shown on the Technology Legend.

2.6.4 For single port voice outlet locations intended for wall telephone connections, a wall telephone type faceplate with attachment studs shall be provided. The wall telephone jack shall be 8-pin, RJ45 type and use IDC wire terminations only. Provide AMP 110 Connect SL Series Category-6A insert, white in color, Part #

1933476-1 within stainless steel wall plate faceplate Part # 1-OE-A5-PHONE-DP. Screw terminal type jacks will not be accepted as an alternative.

- 2.6.5 IP Clock/Speakers - Provide AMP NetConnect 110 SL Series, single port, small surface mounted box Part # 1116697-1, in ivory, for IP Clock/Speaker data outlets. Provide one, gray, 110 SL series Category-6A insert, Part # 1933476-4 with strain relief cap, in faceplate for IP Clock/Speaker data locations. Mount data outlet in back of IP Speaker enclosure.
- 2.6.6 LCD/Audio-Visual - Provide AMP NetConnect 110 SL Series, Dual port faceplate, in ivory, for Audio-Visual data outlets. Provide yellow, 110 SL series Category-6A insert, Part # 1933476-8 with strain relief cap, in faceplate for Audio-Visual data locations. Mount data outlets as shown on the floor plans and details.
- 2.6.7 Wireless Access Points - Provide AMP NetConnect 110 SL Series, Dual port faceplate, in ivory, for Wireless Access Point data outlets. Provide black, 110 SL series Category-6A insert, Part # 1933476-2 with strain relief cap, in faceplate for Wireless data locations. Mount data outlets as shown on the floor plans and details.
- 2.6.8 IP Cameras - Provide AMP NetConnect 110 SL Series, no faceplate, for IP Camera data outlets. Provide Red, 110 SL series Category-6A insert, Part # 1933476-7 with strain relief cap, in faceplate for Wireless data locations. Mount data outlets as shown on the floor plans and details.
- 2.6.9 For single port data outlet locations, the faceplates shall have space for two connections with one port fully operational for connection to all of the specified protocols. The second port shall be covered by a blank plate.
- 2.6.10 For dual port data outlet locations, the faceplates shall have space for two connections with both ports fully operational for connection to all of the specified protocols.
- 2.6.11 For triple port data outlet the faceplates shall have space for four connections with three ports fully operational for connection to all of the specified protocols. The fourth port shall be covered by a blank plate.
- 2.6.12 For quad port data outlet the faceplates shall have space for four connections with all four ports fully operational for connection to all of the specified protocols.
- 2.6.13 All data outlet faceplates shall be electrical ivory in color and shall have a unique sequential identification number applied to faceplate. Hand written labels are not permitted. Faceplates, with the exception of wall telephone outlets and IP Speakers shall include label windows. All color schemes shall be approved by the customer prior to installation.

- 2.6.14 **Colored inserts are required for this project. Refer to the detail drawings for the exact color scheme to be provided. Inserts submitted that do not follow the color and identification requirements will be rejected. Inserts installed that do not follow the color coding as shown in the detail drawings will be replaced at the Contractor's expense.**
- 2.6.15 **All labels will be installed under label windows with the exception of IP Speakers and wall telephone outlets. Labels adhered to the surface of the faceplate will not be accepted unless as shown as an exception above.** Contractor must provide clear laminating type of cover material over the surface mounted labels where used.
- 2.6.16 Reference the drawings for special outlet configurations or plate requirements

2.7 Paging Speakers and Horns

- 2.7.1 The IP-based intercom speakers and horns shall be furnished by the District and installed by the Contractor. All programming of the IP-Based speakers shall be completed by the District.
- 2.7.2 All analog exterior horns shall be furnished and installed by the 27 10 00 Contractor. The Contractor shall also furnish and install the IP Zone Controllers and amplifiers. Install equipment per the detail drawings and specifications.
- 2.7.3 The Contractor shall install the IP based paging speaker/ digital clock combinations in the classrooms and exterior horns where shown on the floor plans.
- 2.7.4 Data Contractor shall be responsible for providing enclosures for all IP based speaker/clocks and analog exterior horns. Contractor shall provide vandal resistant screws with all enclosures for attachment of the speaker/horn baffle. Exterior locations shall be provided with stainless steel vandal resistant screws.
- 2.7.5 Flush mount enclosures shall be furnished by the 27 10 00 Contractor and installed by the Division 26 Electrical Contractor as shown in the floor plans. 27 10 00 Contractor shall deliver enclosures to the Electrical Contractor in a timely fashion so as to not adversely impact the project schedule. Coordinate with Electrical Contractor and Construction Manager as long lead times are typical for this product.
- 2.7.6 Surface mounted enclosures shall be furnished and installed by the 27 10 00 Contractor. All surface mount enclosures shall be provided with vandal resistant screws for attachment of the speaker/horn unit to the enclosure. If enclosure is located on the exterior of the building, the enclosure shall be provided with stainless steel vandal resistant screws. All vandal resistant screws shall be

delivered to the District IT Department for use during installation of the IP speaker/horn baffles by the District.

- 2.7.7 Contractor responsible for proper paging coverage and tap settings at the speakers/horns.
- 2.7.8 All exterior loudspeaker circuits shall operate balanced to ground. Bonding shall be provided to assure equal potential measurement between the chassis of all amplifiers, power supplies, etc. Bond to the ground bus bar.
- 2.7.9 Each exterior horn location cable shall be home run to the IDF rack/cabinet. Provide 1-pair, 18 gauge CMR rated speaker cable to each horn location. Terminate speaker cable on terminal strips or punch blocks.
- 2.7.10 Contractor shall run a speaker cable from the amplifier to the page interrupter for the audio-visual system in each room. The connection will serve to cut off the audio from the AV system when the paging system is engaged. Speaker connections to the AV system may be looped, but the Contractor is responsible for insuring that the signal strength is sufficient to allow the interrupter to operate properly.
- 2.7.11 Recessed flush mount IP Speaker/ Clock combination; Provide flush mount enclosure installed in gypboard wall with District furnished IP clock/speaker. Enclosure shall be as manufactured by Atlas Model #EST-I8SC.
- 2.7.12 Surface mount IP Speaker/Clock combination; Provide surface mount enclosure installed on gypboard wall with District furnished IP clock/speaker. Enclosure shall be as manufactured by Atlas Model # EA-I8SC.
- 2.7.13 Surface mount exterior horn; Provide Atlas Sound Part #APF-15T with surface mount vandal resistant enclosure Part # SE161-R6 and Part #VP161-APF baffle grille. Unit must be weather resistant.
- 2.7.14 Provide a (2) foot long, CAT-6, UTP patch cord, gray in color, for each speaker location to connect to the ethernet drop located in the enclosure. Provide patch cords for 100% of IP Speaker/clock locations. Provide (3) spare patch cords, deliver all Patch cords to the District IT Department.
- 2.7.15 IP speakers/clock and horns shall be connected to the powered ethernet switch in the IDF Room or cabinet. Provide 4-foot long, Category-6 UTP patch cords, gray in color. Provide patch cords for 100% of IP Speaker/horn/zone controller locations. Provide (3) spare patch cords, deliver all patch cords to the District IT Department.

- 2.7.16 All speaker/clock connections to be terminated at the data patch panel. Speakers must be patched to a powered switch in the IDF to allow for proper operation.
- 2.7.17 The District shall be responsible for providing licensing requirements and Informacast software to drive speakers and program tones, bell schedules and announcement controls.
- 2.7.18 Programming of speakers/clock for page coverage zones, tones, time schedules, pass class bell and VoIP interface to be completed by the District IT Department and is also responsible for providing IP addressing and identification of individual speakers.
- 2.7.19 Coordinate with the District IT Department for the set up and programming of the IP Zone Controller in the IDF location. The Contractor shall furnish and install (1) IP Paging Zone Controller in the IDF rack. Provide the rack mount adapter bracket. The zone controller shall be connected to the Network Switch and the paging amplifier. Provide Atlas Part #IPS-ZC1 with power supply.
- 2.7.20 Amplifiers shall be rack mounted in the IDF rack. Provide Atlas Sound Part # PA601. Provide rack mount adapter bracket. Provide (1) amplifier to service the exterior paging horns as shown on the drawings. A separate amplifier must be provided for each IP zone controller output. Multiple amplifiers may be required for a single zone depending on quantity of horns requiring amplification. Contractor is responsible for providing sufficient power amplification to service all horns. Contractor is responsible connecting the amplifiers to the IP zone controllers and insuring proper operation between the zone controller and amplifiers.
- 2.7.21 Contractor shall be responsible for testing all paging speakers and horns and insuring the proper volume levels are set on the paging devices and amplifiers. Provide (4) man hours (not including travel time) for re-adjustment of the paging speakers and horns volume levels per the District's requirements 4 weeks from the final sign-off of the modernization project. Travel time to and from the site shall be included in the service.

PART 3 - INSTALLATION

- 3.1 Upon completion of 10% of the cabling installation, the contractor shall notify the engineer for an inspection of the methods and types of materials used on the project. The contractor shall give a minimum of 72 hours notification to the engineer for the inspection. The contractor will be given a written review of the findings, so if adjustments are required, they can be done before the project proceeds.

- 3.2 Pull strings will be provided with all cable runs including but not limited to; conduit stub ups, conduit sleeves, cable trays, open wiring routes, innerduct, and point-to-point conduits. Pull strings shall be free from cable bundles in open wiring routes. Pull strings shall not be substituted for pull ropes.
- 3.3 Velcro cable management straps are required on all Category-6 cable bundles, the last 20 feet or upon entry into equipment closet, a maximum of 12" apart. Cable bundles shall also be routed through cable management or "D" rings in the equipment closet.
- 3.4 Data contractor shall supply protective bushings or slide on rings at the ends of all exposed conduits used for the data system cabling. This is to include all conduits installed for any future data cabling requirements. Contractor shall submit planned protection bushing prior to installation of cabling for approval.
- 3.5 Velcro cable management straps are required on the rear of the equipment racks and on the patch cords within the vertical cable managers. Straps shall be a maximum of 12" apart.
- 3.6 Every fiber in every fiber optic cable must be terminated at both ends on a fiber patch panel in the IDF closet or on a faceplate in the classroom location. Termination shall be accomplished using Duplex SC type connectors with a long strain relief boot, except for fiber ran to station locations where a short boot shall be used.
- 3.7 All SC connectors shall be of the same manufacture to ensure compatibility. Polarity of fiber strands must be observed at all times.
- 3.8 Labeling
 - 3.8.1 Each cable **run shall be permanently labeled at each end** with a unique sequential number which corresponds to a similar number provided for each data outlet and punch down point. A printed label shall be placed at each of the following locations;
 - 3.8.1.1 On the cable at the rear of the patch panel or termination block. Requires the use of a self laminating wrap around label. Brady Label self laminating 1.2" by 1.5" wrap around label Part # 29689 (**NO ACCEPTABLE EQUAL**).
 - 3.8.1.2 On each cable in the j-box behind the faceplate location. Requires the use of a self laminating wrap around label. Brady Label self laminating 1.2" by 1.5" wrap around label Part # 29689 (**NO ACCEPTABLE EQUAL**).
 - 3.8.1.3 On the face of the patch panel, provide a 3/4" by 3/4" label with a letter or number identifying the patch panel designation.
 - 3.8.1.4 On the face of the faceplate in the label holder window.

- 3.8.2 Hand written labels are not permitted. Where cable ID includes room number identification the contractor shall obtain written verification of actual room numbers prior to beginning labeling (numbers on plans do not always match actual room numbers). Cable pulling cross reference lists will not be accepted with final documentation.
- 3.8.3 Each patch panel port shall be identified with a unique sequential labeling scheme. Port identification labeling pattern shall be consistent throughout the project.
- 3.8.4 All faceplates shall be identified with permanent printed labels. Labels must not be subject to removal by incidental contact. Contractor shall be responsible for replacing defective labeling for a period of one year from date of final sign-off of project.
- 3.8.5 All fiber optic and UTP feed cables shall be identified with a permanent, water resistant, printed labels. Labeling information shall include closet identifications, quantity of conductors (UTP) or strands (fiber) and house pair designations (UTP). Cables shall be labeled at the following locations in the IDF/MDF; at conduit entrance point and prior to entering either punch blocks or patch panels. See details for additional requirements.
- 3.8.6 Labeling will follow recommended EIA/TIA standards or as requested by the customer. Contractor will confirm labeling pattern prior to final identification or testing. All test results will be identified by the final labeling scheme.
- 3.8.7 All fiber optic cables and/or innerduct shall be tagged with fiber optic warning tags in every manhole or pullbox. Fiber warning tags shall also be placed at each end of the cable in the termination closets in clear view. A minimum of (3) tags are required at each end. Fiber warning tags shall be placed on fiber optic cable and/or innerduct routed through open ceiling environments at increments no less than 15 feet apart.
- 3.8.8 Refer to detail drawings for additional labeling requirements.
- 3.9 Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the drawings), the wire shall be bundled together and supported above the ceiling.
- 3.10 All cables must be fastened to the building structure via "j-hooks" or an approved Category 6A suspension system, and not directly in contact with ceiling system. For "j-hooks" maximum fill capacity is as follows: 1-5/16" hooks – 35 cables; 2" hooks - 60 cables; 4" hooks - 120 cables. For quantities beyond 120 cables use a sling support system such as "Erico Cable Cat" or equal. Maximum fill capacity 200 cables. D-rings, "Caddy #WMX cable hangar", "Caddy Bridle Rings", drive rings or any other type of wire ring support is not allowed.

- 3.11 Where cables pass through a fire-resistant portion of the structure, conduit sleeves shall be provided to maintain the rating of the wall penetrated. Sealing of all penetrations with an approved fire barrier is required. Conduits and sleeves must remain accessible for future use. Permanent sealants may not be used to seal sleeves and conduits.
- 3.12 Fiber optic cables connecting to equipment racks shall be installed with not less than 20 feet of slack cable between the rack and the terminal backboard. See drawings for fiber optic service loop requirements.
- 3.13 Provide 6 inches of cable slack at computer data system outlets inside conduit box.
- 3.14 In an accessible ceiling area, provide a 10 foot (circle 8 configuration) service loop above the data/voice outlet locations. Service loop must be tied up off of ceiling tiles or ceiling surface. Neatly coil cable without exceeding minimum bend radius limitations. Do not provide length in excess of 15 feet. May cause improper test results.
- 3.15 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.
- 3.16 Cables installed in manholes and pullboxes on terminal backboards shall be installed on wall mounted cable support racks.
- 3.17 Provide a full 360 degree loop of cable around manhole and pullbox interiors.
- 3.18 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.
- 3.19 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.
- 3.20 Where cables are pulled through or pulled from a center of run, pull without splices or terminations, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by hand for the next run.
- 3.21 For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.
- 3.22 Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after

initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.

- 3.23 When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel.) Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullbox during this operation. Cables shall be pulled directly from cable reels.
- 3.24 All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all voice/data outlets or other equipment locations.
- 3.25 Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) within 36" or within 12" of line voltage equipment or wiring where crossing. Where Flooded Enhanced Category-5 cables or outdoor rated fiber optic cables are routed exposed through ceilings for more than 50'-0", install in innerduct or EMT conduit system.

PART 4 - TESTING

- 4.1 All Category-6 cables shall be point to point (link) tested after installation/termination, and verified to operate at minimum 1000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-6 wiring. In addition, testing shall satisfy all proposed amendments to the existing ISO/IEC requirements. The wiring shall support all specified communication protocols. Testing shall support the Category-6 requirements by the EIA/TIA.
- 4.2 Upon completion of testing cable links, the Contractor shall supply a copy of the original database files downloaded from the tester in original format on disk. Contractor shall provide with database files an original copy of the tester's manufacturer software program (included in original cost) for record management and archiving, in a Windows format (e.g., MicroTest's software program - ScanLink ver.)
 - 4.2.1 10 PC for Windows, WaveTek's software program-LTRM ver.1.07, etc). The manufacturer's software program will be used by the engineer to review all test results, and then turned over to the customer to keep as their record copy with the final approved test results. Provide (3) copies of tests on disk.
- 4.3 Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.
- 4.4 Multimode fiber optic cables shall be tested bi-directionally at 850nm and 1300nm. Single mode fiber optic cable shall be tested bi-directionally at 1310nm and 1550nm. All fiber strands shall be tested with a power meter and light source as well as an OTDR (Optical Time Domain Reflectometer). OTDR fiber tests for runs under 100 meters are

not required. All fiber test results shall contain final source and destination information that matches IDF or MDF labeling shown on drawings. Fiber test results shall be submitted as hard copy and on floppy disk in Microsoft Excel format.

- 4.5 Test procedures shall comply with EIA/TIA 526-14 Method B. Test results shall meet the minimum following criteria:
 - 4.5.1 Fiber optic test results shall not exceed 2db attenuation loss in addition to inherent loss published by manufacturer tested at minimum 2000 Mhz for 850nm and 500 Mhz for 1300nm for the fiber optic cable.
 - 4.5.2 Test all voice/data cables minimum Category-6 UTP cable to test results for "Link Testing" requirements @ 250 Mhz per current EIA/TIA draft requirements. Any cables which do not meet these minimum requirements shall be replaced or repaired at no cost to the customer.
- 4.6 End to end attenuation termination points measure the power loss between end points from both directions.
- 4.7 End to end attenuation testing shall be performed with a temporary test jumper cable at each end of the installed fiber cable. The test jumper shall be the same size as the installed cable. The measured attenuation of the test jumpers, test connectors, and test interconnection sleeve between the two test jumpers shall be less than 1dB as calibrated at the time of the test at indicated wave lengths and frequencies.
- 4.8 Provide (3) hard bound copies of "E-size" drawings and (1) file copy in AutoCAD format copy of floor plan drawings of each building on a USB flash drive. These drawings shall include all outlet locations, major cable routes and outlet and cable identification numbers. Provide detailed elevations of each MDF or IDF locating all equipment and connections.

END OF SECTION

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SECTION 27 20 00
INTEGRATED AUDIO/VISUAL SYSTEM

PART 1 – GENERAL

SUMMARY

- 1.1 The Contractor shall furnish all labor, project management, materials, tools, equipment, and resources necessary for the installation, startup, and testing of the system shown on the plans and described in the specifications.
- 1.2 Related Specification Sections:
 - 1.2.1 Section 26 01 00 -General Provisions
 - 1.2.2 Section 26 05 33 -Conduit and Fitting
 - 1.2.3 Section 26 05 19 -Conductors
 - 1.2.4 Section 26 05 34 -Outlet and Junction Boxes
- 1.3 The Contractor shall furnish and install the system as defined by the plans and specifications. The Contractor must demonstrate to the Owner that the system is complete and complies with all operational requirements set forth in the plans and specifications.
- 1.4 The work covered under this section of the specifications consists of furnishing all labor, equipment, supplies and materials, and in performing all operations necessary for the turnkey and fully completed installation of an audio/ video system in accordance with the specifications and accompanying drawings, except as specifically noted otherwise.
- 1.5 Cables for the system shall be pulled through the conduit systems furnished by the building Contractor. The 27 20 00 Contractor shall be responsible for providing all cables required and for coordinating and supervising the cable installation. The 27 20 00 Contractor shall be responsible for ensuring the integrity of the cables before and after installation.
- 1.6 Work Excluded:
 - 1.6.1 Excluded from this work shall be any and all general construction services regarding masonry and general carpentry services. Those services are to be provided and installed by the general Contractor.
 - 1.6.2 Conduit/raceways, sleeves, cable trays, electrical boxes, hand holes, pullboxes, etc. required for the system shall be furnished and installed by the Electrical Contractor. The conduit/raceways and electrical boxes furnished and installed under Electrical Contractor shall conform with the requirements of the drawings and specifications for the system.

- 1.7 In order to ensure project cohesion a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all labor; cabling; equipment; software; supplies; materials and training. The Contractor will perform all operations necessary for the "TURNKEY" and fully completed installation in accordance with the specifications herein. As such, the successful Contractor must be factory trained on all aspects of system hardware. The successful Contractor shall be a California licensed C7 or 10 premise wiring Contractor as defined in this specification. SubContractors may not be utilized in the implementation of the plant wiring installation.
- 1.8 Approval to bid shall not release the Contractor from full specification compliance requirements. Final system acceptance testing shall govern final system acceptance and compliance with the specifications.
- 1.9 Failure to provide a functional equivalent shall result in the removal of the alternate system at the Contractor's expense.
- 1.10 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.
- 1.11 Where the words 'provide' or 'provision' is used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.
- 1.12 Where items are specified in the singular, this division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

DEFINITIONS

- 1.13 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.
- 1.14 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.
- 1.15 Finish Space: Any space ordinarily visible, including exterior areas.

Contractor Qualifications

- 1.16 The successful bidder shall be a California licensed C7 or C10 premise wiring Contractor as defined in this specification. Subcontractors may not be utilized in the implementation of the installation or programming.

- 1.17 The successful bidder shall have design staff with a minimum of the following certifications and shall include all certifications with their bid.
 - 1.17.1 (1) BICSI certified (RCDD) Registered Communications Distribution Designer.
 - 1.17.2 CTS Certification
 - 1.17.3 Extron XTP Systems Engineer
 - 1.17.4 Extron TLP programming certifications
 - 1.17.5 Extron Global Configuration Certification
- 1.18 The successful bidder shall have installation staff with a minimum of the following and shall include all certifications with their bid.
 - 1.18.1 CTS-I certification
 - 1.18.2 Extron Advanced A/V Certifications.
 - 1.18.3 Contractor must have a minimum of (8) full time certified installation technicians with Extron Certifications (include certifications with submittals)
- 1.19 All bidders must provide a listing of two similar size projects having the same scope of work using the proposed information delivery equipment. This listing shall be complete with facility names, completion dates, names of contacts, and their telephone numbers. Referenced projects must have been completed in the past 18 months.
- 1.20 The bidder shall have a factory trained service department. The service department shall be on call 24 hours a day, 365 days a year, to arrive and initiate onsite service the specified equipment upon (24) hours notice.
- 1.21 The Contractor shall employ factory-trained technical/service personnel for service and maintenance of the system. Their résumés will be required. The factory-trained technical/service personnel shall have a minimum of two years experience installing the proposed system. The Bidder shall submit the names and copies of the certificates issued by the factory. The bidder shall instruct the Owner's technical personnel in the operation, care, and maintenance of the system.

CODE COMPLIANCE

- 1.22 All material and equipment shall be clearly listed, labeled, or certified by Underwriters Laboratories, Inc. All power supplies and computers shall be clearly UL Listed. Any system which is not UL Listed at time of bid will be rejected.
- 1.23 All acceptable systems shall be approved under Part 15, Subpart B, Section 15.107b of the FCC Rules and Regulations. Bidders must provide the FCC Registration Number of the proposed system. Systems that are not in compliance with the FCC will not be

considered. Any system that is not FCC compliant at time of bid will be rejected. All equipment must be clearly labeled with FCC compliance stickers.

- 1.24 The system shall be installed in accordance with local and national electrical codes.
- 1.25 The manufacturer and Contractor shall provide the Owner with a release for use of all copyright materials, corporate logos, and corporate trademarks at time of bid.

SUBMITTALS

1.26 General Submittal Requirements

- 1.26.1 Phase I Submittal shall be made in electronic format within (20) working days after the award of the contract by the District. This submittal shall include the following:
 - 1.26.2 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed:
 - 1.26.3 Description and quantity of each product.
 - 1.26.4 Manufacturer's Name and Model Number.
 - 1.26.5 Manufacturer's Specification Sheet or Cut Sheet. Material Cut Sheets shall provide detailed product information and shall be original manufacturer product bulletins. **Copies of material information from vendor websites shall not be considered equal and will not be excepted.**
 - 1.26.6 Material Cut Sheet part number provided shall be highlighted or provided with an arrow directed at the corresponding part number.
 - 1.26.7 Specification Item Number referenced for each required product or if not shown in the specifications, Drawing Detail Number being referenced. (ie; Spec. 27 10 00 Item 2.1 or DWG E4.15/#1)
 - 1.26.8 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.
- 1.27 Phase II Submittal shall be provided within (20) working days after the approval of the Phase I submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered in a CAD Software. Submission shall include electronic print copies to match the contract drawings, and Phase II submittals drawings shall include the following.

- 1.27.1 MDF and IDF equipment rack or cabinet elevations will be required to be provided including cable routing, grounding, support, UPS, network electronics, etc. and position of all components in the rack or cabinet.
- 1.27.2 Provide labeling plan which identifies the proposed scheme for identifying all components including Racks, patch panels (fiber and copper), site distribution feed cables, horizontal station cables and site conduit systems (handholes, pullboxes, etc.).
- 1.28 Common submittal mistakes which will result in submittals being rejected:
 - 1.28.1 Not including the qualifications of the installing Contractor Company and Contractor's Staff.
 - 1.28.2 Not including all items listed in the above itemized description.
 - 1.28.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed (provided for the project) or crossing out the items which are not applicable.
 - 1.28.4 Not including actual manufacturer's cut sheets or catalog information of proposed products.
 - 1.28.5 Do not provide website sales pages instead of Material Cut Sheets. Printing the entire web page with advertising and non-applicable items or information will not be acceptable.
 - 1.28.6 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" or "to be determined later" statements. The products being submitted must be the products installed.
- 1.29 Component Samples and Mock-ups
 - 1.29.1 Provide one full size installation sample mock-up of a normal wall faceplate for approval. All samples are to be fully labeled per these specifications. Samples are to be delivered to the Construction Manager's office on site prior to installation.
 - 1.29.2 All sample mock-ups are intended to represent the components that are to be installed as part of this project. They are to be provided with all associated components and labeling necessary to make up a complete mock-up. Installation shall not proceed until the Owner's Representative has approved the samples. Once samples and other documents have been submitted and inspected by the Owners Representative approved, they shall be retained. Any installation that does not meet this standard shall be replaced or re-worked as approved by the Owners' Representative at no cost to the project.

- 1.30 The Contractor shall make a written request directly to Johnson Consulting Engineers for electronic drawing files (CAD). As a part of the written request, please include the following information:
- 1.30.1 Clearly indicate Project Name and Client, Johnson Consulting Job Number (located in bottom left corner of JCE Engineering Stamp) and each drawing Sheet Number required (i.e., E1.1, E2.1, E4.1 etc.).
 - 1.30.2 Identify the name, Company, Title, phone number, mailing address and e-mail address of the person to receive the files.
 - 1.30.3 Detail or Riser diagram sheets, System Schematic drawings or any other drawings other than floor plans or site plans, will not be made available to the Contractor.
 - 1.30.4 Files will only be provided in the AutoCAD format in which they were created (i.e., version 2015 or version 2016). Files will not be made available in REVIT format.
- 1.31 Requests for files will be processed as soon as possible; a minimum of (7) working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use and delays in requesting files will not alleviate the Contractor from submitting required documents within the required timeline.
- 1.32 Contractor shall be responsible for the complete provision and installation of all components as specified herein. The Contractor shall provide all tools, equipment, fixtures, appliances, ancillary piece parts and hardware as necessary to complete the assembly and installation as requested. The Owner's Representative may conduct scheduled or unscheduled inspections of the Contractor's work at any time during construction. All work included in the scope assigned to the Contractor that is associated with this project shall be accomplished in a workmanlike manner, installed and assembled plumb, level and square. The product shall be delivered to the Owner finished complete, and ready to operate according to the manufacturer's specifications.
- 1.33 All installation work shall be completed to the standard of the samples approved by the Owner's Representative during the submittal process. Any products not installed to the quality detailed in these specifications and approved in the submittal process shall be reworked by the Installer to the satisfaction of the Owners Representative at no additional cost to the Owner.
- 1.34 Products as manufactured by "Extron" have been specified to coordinate with an existing facility and other contracts to be issued for this project. Alternate products will not be approved.

SEISMIC ANCHORING

- 1.35 All sound systems, A/V equipment or enclosures shall be anchored to the structure. Where details have not been provided on the drawings, anchorage shall comply with CBC Section 1632A and Table 16-A0. The Contractor shall submit drawings signed by the Contractor's registered structural engineer indicating method of compliance prior installation.

CLEANUP

- 1.36 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.
- 1.37 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.
- 1.38 During the progress of the work, keep the premises clean and free of debris.

GENERAL COORDINATION

- 1.39 The A/V drawings may reference components by manufacturer which conflict with the written specification requirements, where this occurs the written specifications shall be followed.
- 1.40 The 27 20 00 Contractor shall actively coordinate all power requirements for the Audio-Visual Systems with the Division 26 Electrical Contractor. The 27 20 00 Contractor shall coordinate the placement of the electrical outlets and hard-wired power connections at projectors, AV Systems cabinets and other equipment, with the Division 26 Contractor to determine the exact placement of the power. Outlet placement in many of the applications is critical to the space requirements and power cord length of the equipment or devices being installed.
- 1.41 Warranty: All components and installation, shall be warranted by the Manufacturer to the School District for a period of **2-years** after District acceptance and sign-off of the completed system. With the exception of the following equipment that shall be provided with longer warranties as noted;
- 1.42 Contractor shall provide a spreadsheet for the District provided asset tags for all newly installed AV equipment. Contractor shall provide the populated tag list at the end of the project as part of their turn-over documents.
- 1.43 Contractor shall coordinate assignment of ALL installed IP addressable equipment. The District will provide a list of available IP addresses based on Contractor's device count. Contractor shall provide a spreadsheet containing the IP and MAC addresses as well as each particular device location. This list shall also contain the Switch Port Number, and Label Description.

PART 2 — PRODUCTS

General Audio-Video Requirements:

- 2.1 The Contractor shall refer to the Audio/Video Patch Cable section of this specification for the descriptions of the type and style of patch cable to be furnished for the different Audio-Visual and data patch cable connections. Patch Cable Section includes the different requirements for cable runs based on length and style of connector. HDMI cables shall be furnished as outlined in this section and based on the length of the cable, the model of HDMI cable required will vary. Individual patch cord specifications are not shown in the room system descriptions, only the type of cable required will be shown.
- 2.2 Contractor shall furnish and install all Audio-Visual system components as shown in the A/V system details and these specifications. Refer to the Audio-Visual System Diagram for additional information. The drawing details and specifications shall be considered as one overall document. Contractor shall provide all systems as complete turn-key operational Audio-Visual systems.
- 2.3 Document Camera, Computer and Monitors units shall be furnished by the District and installed by the District.

Flat Panel Monitor System Requirements

- 2.27 LED Flat Panels shall be furnished by the District and installed by the Contractor. Contractor shall install Flat Panel with audio/video components and local wiring for the locations as shown on the floor plans. LED Flat Panels Monitors shall be located per the drawings and specifications. Refer to the drawing details for the Flat Panel mounting requirements and the floor plans for the locations of the panels.
- 2.28 Provide Passive Flat Panel AV System in the Conference Room #110, Collaboration Room #128 and the Lobby Room #158. The flat panel systems shall be furnished with Passive HDMI input wallplate, Passive HDMI output wall plate and Dual Port Flat Panel data outlet connection. Each location shall be controlled using the Flat Panel Monitor's Remote Control unit.
- 2.29 The LED Flat Panel shall serve as support for the Offices and Conference Room in the Administration Building. The flat panel's speakers will be used for all local audio output. Provide (1) Passive HDMI Input wallplate connection to each LED Flat Panel.
 - 2.29.1 Manufacturer and Size of LED Flat Panel may vary. Confirm Flat Panel specifications prior to installation of the Flat Panel Mount with the District IT Department.
 - 2.29.2 Provide Category-6 patch cable for connection from the LED Flat Panel Monitor to the data outlet behind the Flat Panel, length as required. Coordinate IP Addressing with the District IT Department. The Flat Panel shall be programmed for direct Ethernet connection to the local LAN.

- 2.29.3 Provide Active HDMI wallplate for the Laptop PC connection. See Wallplate specifications for requirements.
- 2.29.4 LED Flat panel monitors shall be set-up to limit accessibility to the controls in public areas of the building. Panels shall be capable of public display settings, so the local controls can be locked out. All flat panels shall be mounted with vandal resistant hardware to insure security of the monitors.
- 2.30 Provide Flat Panel with a surface mount, dual arm, articulating, Flat Panel TV Mount. The dual arm mount shall be provided with a universal VESA type bracket and does not require a separate bracket to be ordered.
 - 2.30.1 Provide Flat Panel with a recessed type wall mount by Chief Manufacturing Model #PNRIWUB dual arm support as shown on the drawing details. Refer to the detail drawings for the flat panel mounting outlets and conduit requirements. Contractor shall furnish the adapter plate from Chief to mount to the model of flat panel provided. Confirm all heights of the mounts with the Project Engineer, District Project Manager and Construction Manager prior to installing the mounts. Exact height of the flat panels must be field verified by the 27 20 00 Contractor prior to rough-in
 - 2.30.2 The final location of the Flat Panel Monitor shall be determined by any clearance required to access any controls or connections and clearances required to make adjustments (Pan, Tilt and Extension) to the Flat Panel.
 - 2.30.3 The 27 20 00 Contractor must coordinate with the Division 26 Contractor and the Construction Manager for the proper placement of the junction boxes for the power, data and audio-visual connections at the Flat Panel locations. Coordinate no later than two weeks before the Rough-In date shown in the Construction Schedule for the Division 26 Contractor. Audio-Visual cable connection J-Boxes shall be provided at both the bottom (from the Floor Box) and at the top (from Accessible Ceiling) in all locations shown on the Floor Plans with Floor Boxes.
- 2.31 The 27 10 00 Contractor will provide a 2-Port Category-6 UTP data outlet at the Flat Panel Display and at the Local Origination "LO" HDMI Input Wallplate locations. Coordinate the data outlet location with the 27 10 00 Contractor.
 - 2.31.1 Provide Category-6 patch cable from the data outlet in the Floor Box to the Cable Cubby in the Conference Table, length as required. Install patch cable for the network connection. Patch cable must be provided with slack to allow the User to pull out the Patch Cable for connection to the Computer.
 - 2.31.2 Provide Category-6 Patch Cable from the data outlet behind the Flat Panel Monitor directly to the Ethernet port on the Flat Panel Monitor. All Category-6 UTP data outlets will be furnished by the 27 10 00 Contractor.

- 2.32 Refer to the drawing details and Audio-Visual System Diagrams in the drawings for Classroom Flat Panel installation and for additional requirements.
- 2.33 Provide an Extron WPD-110A Passive HDMI Decora Style Transmitter Input Wallplate for the Local Origination "LO" computer connection to the flat panel. See floor plans for the location of the input wallplate.
 - 2.33.1 Input Wallplates installed in floor boxes shall be provided with the proper size Decora-Style faceplate to fit the floor box. Contractor may be required to field modify the faceplate to fit in the Floor Box, depending on the size and type of floor box. Coordinate with the Div. 26 Contractor for Floor Box requirements.
 - 2.33.2 Provide HDMI cable from the Transmitter Input wallplate location "LO" to the Receiver Output wallplate location behind the Flat Panel Monitor. Length of cable shall be as required. Provide Hybrid-Fiber Optic HDMI cable in length for the Input Wallplate connection. See the AV Patch Cables Section for requirements.
 - 2.33.3 Provide a Swivel Head Type 12-foot HDMI Patch Cable from the HDMI Input wallplate to the Laptop PC or Permanent PC location. Locations with Cable Cubbies and Floor Boxes shall have patch cables plugged into the Floor Box or Other Device. See the AV Patch Cables Section for requirements
 - 2.33.4 The Cable Cubby must be provided with enough slack to comfortably connect to the Laptop. Coordinate the Conference Table size (Furnished and Installed by District), location of Cable Cubby, location of Floor Box and required length of patch cable above the table. HDMI Patch Cable length may need to be longer for the connection. Generate an RFI to the Project Engineer for instructions on how to proceed to resolve cable length issue.
 - 2.33.5 Provide an HDMI (Female) to DisplayPort (Male) adapter for each of the Laptop PC Wallplate Input locations. The adapter shall be provided with the HDMI patch cable assembly.
- 2.34 Provide an Extron WPD-110A Passive HDMI Decora Style Receiver Wallplate for the connection to the flat panel. Receiver wallplate shall be provided at the Flat Panel location. See floor plans for the location of the Flat Panel.
 - 2.34.1 Provide HDMI Patch Cable from the Receiver wallplate location to the flat panel HDMI Input #1 location. Length as required.
- 2.35 Provide an Extron Cable Cubby 100 - 4" Round Insert in the Conference Room Table for the Local Origination "LO" computer connection to the flat panel, via the Floor Box. See floor plans for the location of the Floor Box. Provide Extron Cable Cubby 100 in the Conference Room #110 and the Collaboration Room #128 only.
 - 2.35.1 Provide HDMI and Category-6 Patch Cables from the Cable Cubby to the Floor Boxes. Patch Cables shall be provided with cable loom and neatly dressed. Patch

cables also require enough slack to pull up the patch cable and make the connection to the computer. Install patch cables per the manufacturer's instructions.

- 2.35.2 Provide 20A-120V outlet in the Cable Cubby for the power connection. Provide the power outlet with a power cord to the power outlet in the Floor Box. Neatly dress the power cord to the floor box.
- 2.36 Refer to the drawing details and Audio-Visual System Diagrams in the drawings for Classroom Flat Panel installation and for additional requirements.

Audio/Video Patch Cables

- 2.37 All patch cables must be factory manufactured. Cables may not be field modified or altered. Length of cable shall be as required by the specification section. If length is not specified, the cables shall be the nearest factory manufactured length above the minimum distance required.
 - 2.37.1 Audio Cable Assemblies 25-feet in length or less; All 3.5mm stereo audio cable assemblies shall be a male-to-male cable fully shielded cable with 3.5mm bayonet style connectors. Extron Mini Audio Cables Series or equal. Provide minimum length of 6 feet.
 - 2.37.2 HDMI Standard Patch Cables 1.5-12-feet in length; All HDMI patch cables must be 4K verified and must conform to the HDMI 4K Premium cable standards. Patch cable shall be Extron HDMI Ultra Series High-Speed, ultra-flexible patch cables. Length of patch cable shall be as required for proper operation.
 - 2.37.3 HDMI Cable Assemblies for HDMI Input Connections from Floor Box or Lobby Counter; All HDMI patch cables must be 4K/30 verified and must conform to the HDMI Premium and High-Speed cable standards. HDMI cable assemblies must be a fiber optic/copper hybrid construction with detachable ends. Cables shall be Hall Research CHD-DE* 4K Javelin™ Active HDMI Cable w/Detachable Ends or Kramer CP-AOCH Series High Speed. Length of patch cable shall be as required for proper operation.
 - 2.37.3.1 HDMI cable assembly must be installed with the manufacturer furnished "cable pulling sock". Damaged or inoperable cable assemblies due to improper installation procedures shall be replaced by the Contractor at no expense to the District. Please note Manufacturer's Cautionary Warning on product specification sheet – "DAMAGED DUE TO CONNECTOR BEING PULLED HARDER THAN 20 kg, IS NOT COVERED BY WARRANTY - To pull cable through conduits or tight spaces, never grab the connector, as it is easy to exceed the force limit on the connector, instead, remove the detachable end, protect the connector using a cable pulling sock and make sure the force is applied directly to the cable jacket."

- 2.37.4 HDMI Cable Assemblies for the Conference Table Cable Cubby locations - 12 feet in length; All HDMI patch cables must be 4K/30 verified and must conform to the HDMI Premium and High-Speed cable standards. Cables shall be furnished with 180o swivel head design, Vanco Pro Digital High-Speed HDMI Swivel cable, UL and CL3 rated.
- 2.37.5 Category-6 Patch Cables 25-feet or Less; Category-6 UTP patch cables shall be as manufactured by Leviton or Commscope or approved equal. Patch cables shall be provided with standard patch cable material.
- 2.37.6 All patch cables shall be provided for each type of connection required to provide a complete and operational system. All patch cables shall be factory manufactured.

Portable Systems

- 2.38 Portable Equipment shall be furnished, and spares supplied to the designated representative of the Client, along with complete documentation of the materials provided. Where applicable, deliver portable equipment in the original manufacturer's supplied packaging.
- 2.39 Contractor shall furnish (1) Portable ADA Assistive Listening Systems Kits that may be used for Conference Rooms or other small meeting spaces. The portable system is currently designated for use in Room D101 in the New Classroom Building.
 - 2.39.1 Provide for each Kit; A self-contained portable wireless FM transmitter and receivers inside a self-contained carrying case. Portable ADA Assistive Listening system shall be as manufactured by Williams Sound Corporation, Phone 1-800-843-3544. Provide self-contained FM based system Model #FM ADA Kit 37 RCH. System kit shall contain the following items;
 - 2.39.1.1 (1) PPA T46 transmitter, (4) PPA R37 receivers, (4) HED 027 headphones, (1) MIC 090 Mini Lavalier microphone, (1) MIC 049 conference microphone, (1) CCS 029 carrying case, (1) NKL 001 neck loop receiver, (1) ADA wall plaque and (5) BAT 026-2 "AA" batteries.

Classroom AV System Training

- 2.40 **Contractor will provide a minimum of 4 clock hours of on-site training for site Administrative/Teaching Staff on the Flat Panel A/V systems.** Training for personnel shall be provided by certified technology specialists. The scope of training shall encompass system operation and procedures. Technician training should include an integrated information overview, media retrieval procedures as well as operation procedures for local control configurations. The Contractor shall provide a detailed written outline clearly describing the proposed plan for all training, for approval by the

Engineer and Owner's representative. Contractor shall submit at training schedule to the District to coordinate which District Technical staff shall be trained.

- 2.40.1 Training for Teaching and Administrative Staff shall include basic system concepts. Faculty and staff shall be taught how to power on/off the system, control volume, access inputs, attach microphones, replace batteries, and test system for basic operations and all other operational requirements for daily use of the systems. Training shall include use and operation of audio devices, techniques and troubleshooting tips. Trainers shall incorporate hands-on techniques to maximize staff opportunity to incorporate into their curriculum that is both meaningful and targeted for their student needs. Clearly written support materials should be provided to all training participants. Manual describing operation and use of the system shall also be provided.
- 2.41 Trainers shall provide Site or District Technicians with an in-depth technical overview of sound system equipment. Training should include basic overview of all equipment manuals and troubleshooting concepts. Site and District Technicians will be trained to provide setup, operation and application of sound systems. Technicians shall be instructed in the proper operation to replace all components of the sound systems. Clearly written documentation and support materials must be provided for each system. Provide support materials in a three-ring binder clearly for each system. A training manual describing operation and use of the system shall also be provided.

PART 3 - INSTALLATION AND EXECUTION

- 3.1 Verify that all electrical requirements including junction boxes, empty conduit and power circuits and receptacles are in place as shown on the drawings.
- 3.2 Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- 3.3 Installation practices shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices, "Sound System Engineering", (2nd Edition) D. Davis, and Performed to the highest standards of acknowledged industry practices. Upon request the A/V Contractor shall furnish all equipment and labor to verify the compliance with the following:

Audio System:

- 3.3.1 Signal-to-noise ratio (including crosstalk): 55-dB minimum.
- 3.3.2 Total harmonic distortion: 0.1% maximum from 30 Hz to 15,000 Hz.
- 3.3.3 System frequency response: ± 1.0 dB, 20 Hz to 20,000 Hz.

- 3.3.4 Program reproduction system with point-source loudspeakers: Flat response from 63 Hz to 2.5 kHz $\pm$ 2-dB, decreasing uniformly from a relative level of 0-dB at 2.5 kHz to a relative level of -10-dB at 10 kHz as measured on axis of loudspeaker.
- 3.3.5 Sound output capability: Program levels of not less than 100 dB without objectionable distortion, rattles, or buzzes.
- 3.3.6 Hum and noise is inaudible (below the background noise level of the space) under normal operation and as observed in normal seat locations.

Video System:

- 3.3.7 Signal-to-noise ratio (peak to RMS, unweighted DC to 4.2 MHz): 55-dB minimum.
- 3.3.8 Crosstalk (unweighted DC to 4.2 MHz): 45-dB minimum.
- 3.3.9 Frequency response: $\pm$ 0.5 dB to 4.2 Mhz.
- 3.3.10 Line and field tilt: 2% minimum.
- 3.3.11 Differential gain: 3% maximum.
- 3.3.12 Differential phase: 2° maximum.
- 3.3.13 System timing sync coincidence: within 50 nanoseconds.
- 3.3.14 Color timing: $\pm$ 2° at 3.58 Mhz.

Radio Frequency (RF) System:

- 3.3.15 Visual Carrier level: +0 dBmV minimum and +16 dBmV maximum at system outlets for utilized channels.
- 3.3.16 Adjacent Channel Visual Carrier: 3-dB maximum differential at system outlets.
- 3.3.17 Non-adjacent Channel Visual Carrier: 0-dB maximum differential at system outlets.
- 3.3.18 Carrier-to-Noise Ratio: 42-dB minimum
- 3.3.19 Amplitude Response: Flat $\pm$ 1.0 Db
- 3.3.20 Signal-to-Noise Ratio: 45-dB minimum for the maximum level of the signal and the interference resulting from cross modulation from other signals on the system, after demodulation.
- 3.3.21 Outlet-to-Outlet Isolation: 25-dB minimum.

- 3.4 Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
- 3.5 Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.
- 3.6 Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings. Install adequate support structures for 10-foot cable service loops at each TC.
- 3.7 Provide lacing bars for cable management in all of the sound systems cabinets. Contractor shall be responsible for providing neatly dressed cable bundles within the sound cabinet. Cables shall be dressed separately for Microphone and line level cables, speaker and monitor cables, control cables and power cables and video cables. All cables shall be neatly labeled with wrap around type written labels.
 - 3.7.1 On the cable at the rear of the patch panel or termination location. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part # 29689 (NO ACCEPTABLE EQUAL).
- 3.8 All faceplates shall be labeled with type-written permanent labels securely attached to the faceplates identifying all A/V connections. (ie; Doc Cam, PC, Audio Only, etc.) Cables at the projector and A/V switch shall be also be labeled to match the faceplates.
- 3.9 Group cables according to signals being carried. To reduce signal contamination, form separate groups for the following:
 - 3.9.1 Power cables.
 - 3.9.2 Control cables.
 - 3.9.3 Video cables.
 - 3.9.4 Audio cables for signals less than minus 20 dBm.
 - 3.9.5 Audio cables for signals between minus 20 dBm and plus 30 dBm.
 - 3.9.6 Audio cables for signals above plus 30 dBm.
- 3.10 Run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the back. Run other cables on the right side of an equipment rack.
- 3.11 Cut cables (except video, camera and RGBS cables, which must be cut to electrical length) to the length required by the run. All wire and cable shall be continuous and splice-free for the entire length of run. For equipment mounted in drawers or on slides, provide the interconnecting cables with a service loop of appropriate length.

- 3.12 Install no cable with a bend radius less than that recommended by the manufacturer.
- 3.13 Provide strain relief for cables. Provide connectors with metal shell/casings. Provide a minimum of three feet of free cable coiled in a floor pocket. Use spiral wrap to group similar cable types.
- 3.14 All shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, panels, or equipment enclosures. Tin all terminated shield drain wires and insulate with heat-shrink tubing.
- 3.15 Land all field loudspeaker wiring entering each rack at terminal devices prior to connection to equipment or devices. Land loudspeaker level control cables at screw or tubular clamp type barrier blocks on the left side of the equipment rack as viewed from the rear. Make all connections to screw-type barrier blocks with insulated crimp-on spade lugs. Size all lugs properly to assure low-resistance connections.
- 3.16 Separately dress, route and land microphone and line level cables directly to equipment.
- 3.17 Use only rosin core 60/40 tin/lead solder for all solder connections.
- 3.18 Lace, tie or harness wire or cable in accordance with accepted professional practice. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point. Provide service loops where harness of different classes cross or where hinged panels are to be interconnected.
- 3.19 Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. NEMA code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible.
- 3.20 Upon completion of the work, remove all refuse and rubbish from and about the premises, and leave the relevant areas and equipment clean and in an operational state.
- 3.21 During the installation, and up to the date of final acceptance, protect finished and unfinished work against damage and loss. In the event of such damage or loss, replace or repair such work at no cost to the owner.
- 3.22 Prior to final acceptance, provide minimum of three complete sets of drawings showing all cable numbers and construction details in accordance with the actual system installation. Revise the device layout drawings to represent actual installation locations and coordinate these with the electrical Contractor. The operation manual shall contain all instructions necessary for the proper operation of the installed system and manufacturer's instructions. The maintenance manual shall contain all information required for the "proof of performance" as required and all manufacturers' maintenance information.

Inspection and Test upon Completion

- 3.23 Check out and final connections to the system shall be made by the Contractor of the products installed. Technicians shall demonstrate operation of the complete system and each major component to the Owner.
- 3.24 System field wiring diagrams shall be provided to the owner by the system Installer (Contractor) prior to completion of the installation.
- 3.25 All materials and installation shall be guaranteed to be free of defects in material and workmanship for two years after final acceptance of installation and test.
- 3.26 Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
- 3.27 The Contractor shall be responsible to provide service within 24 hours (or by mutual consent) after notification by the Owner or his representative, within the hours of 8:00 AM to 5:00 PM from Monday through Friday. Service request forms shall be supplied by the Contractor and the faxing or mailing of such a request form shall constitute notification by the Owner of a service request.
- 3.28 The Contractor shall provide two "preventative maintenance" service calls, spaced six months apart, for cleaning of all source devices and overall inspection of the system.

PROJECT CLOSEOUT

- 3.29 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this division, in accordance with these specifications and as described below.
- 3.30 Equipment Lists and Maintenance Manuals:
 - 3.30.1 Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this section of the specifications:
 - 3.30.1.1 Name, model, and manufacturer.
 - 3.30.1.2 Complete parts drawings and lists.
 - 3.30.1.3 Local supply for parts and replacement and telephone number.
 - 3.30.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.
- 3.31 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available

manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subContractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

RECORD DRAWINGS

- 3.32 The Contractor shall maintain record drawings as specified in accordance with these specifications, and as noted below.
- 3.33 Drawings shall show locations of all concealed and exposed conduit runs, giving the number and size of conduit wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with referencing CORs and RFIs, the drawings shall reflect all the actual changes made.
- 3.34 Final As-Built Drawing Submittals - Provide (1) hard bound copy of "E-size" As-Built drawings and (3) copies on USB Flash Drive in AutoCAD (2020 or newer version) format. A Hand marked-up copy of the original construction drawings will not be accepted as the final As-Built drawing submittal. Final As-Built drawings shall include copies of the floor plan drawings of each building, detailed As-built AV Diagrams including wire and connection type, elevations of all AV Cabinets, quantities of mic outlets and speaker locations, locations of all final cable routes, including conduits. In addition, the drawings shall include all outlet locations with cable identification label information.

END OF SECTION

SECTION 27 41 19
PORTABLE ASSISTIVE LISTENING SYSTEM

PART 1 GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other Sections for work related to those other Sections and required to be included as work under Division 26.
 - 2. General Provisions and Requirements for electrical work.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's product literature, component dimensions, describe components within assembly, anchorage and fasteners, and special installation requirements.
- C. Shop Drawings: Indicate plan views, elevations, sections, details, and attachments to other work.
 - 1. Show typical details of assembly, erection and anchorage.
 - 2. Include wiring diagrams for power, control, and signal systems.
 - 3. Submit block wiring diagrams and catalogs data showing component interconnection and descriptive literature for all component parts and cabinets.
 - 4. Show complete layout and location of equipment, including required clearances and coordination with adjacent construction.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for District's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.

1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide products by the same manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.
 - 1. Warrantee station for the brand of equipment specified and maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.
 - 2. Maintain a spare set of all major parts for the system at all times.
 - 3. All circuit boards, amplifiers and control sub systems are to be 100% backed up with stock at Contractor's Shop.
- D. All equipment shall conform to Federal, State and Local applicable Codes, Ordinances and AHJ, listed and labeled by Underwriters Laboratories.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Assistive-listening systems shall be provided in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.
- B. The minimum number of receivers to be provided shall be equal to 4% of the total number of seats, but in no case less than two. 25% minimum of receivers provided, but no fewer than two shall be hearing aid compatible in accordance with CBC Section 11B-706.3.

Capacity of Seating in Assembly Area	Minimum Number of Receivers	Minimum Number of Receivers Hearing-Aid Compatible
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats	2
201 to 500	2, plus 1 per 25 seats over 50 seats	1 per 4 receivers
501 to 1000	20, plus 1 per 33 seats over 500 seats	1 per 4 receivers
1001 to 2000	35, plus 1 per 50 seats over 1000 seats	1 per 4 receivers
2001 and over	55, plus 1 per 100 seats over 2000 seats	1 per 4 receivers

- C. Provide a sign in each classroom and assembly area including the symbol for hearing loss in compliance with CBC 11B-216.10 and 11B-703.7.2.4.
- D. If the system provided is limited to specific areas or seats, then such areas or seats shall be within a 50 foot viewing distance of, and have a complete view of the stage or playing area. CBC Section 11B-219.4.

2.02 MANUFACTURERS

- A. Centrum Sound.
- B. Listen Technologies.
- C. PhonicEar.
- D. Williams Sound.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GENERAL

- A. Assistive Listening System to include the following items:
 - 1. Program source wireless transmitter units.
 - 2. Portable wireless receiver units.
 - 3. Plug-in microphones and earphones, for each unit.
 - 4. Multiple program source inputs for, Instructor's microphone, respective room audio/video A/V system input/output and Instructor's computer audio input/output.
 - 5. System accessories.
- B. Function
 - 1. The Assistive Listening System shall provide amplified available audio programs for hearing impaired students/audience, originating from classroom/stage/room instructors and audio/video instructional program source materials, and equipment in respective building spaces, rooms, classrooms and outdoor areas.
 - 2. The audible program shall be transmitted wireless from the program source to the student/audience, with reception coverage throughout not less than approximately 80% of the respective floor space/area space.
 - 3. Provide automatic stereo or mono audio full system operation, depending on pro-program source input.
 - 4. The system in each space shall comply with Federal ADA, State and Local AHJ Requirements for the hearing impaired.

2.04 MATERIAL (INFRARED WIRELESS)

- A. General
 - 1. Provide power on-off control on each unit, to extend battery duration.
- B. Program Source Transmitter (Infrared Emitter) Units
 - 1. The infrared emitter/transmitter shall be compact, portable units, self-contained ABS/plastic housing/enclosure.
 - 2. The emitter panel shall be a dual-channel system operating on both 2.3 and 2.8MHz invisible infrared light waves frequencies. The channels shall be designated "CHANNEL A" for the left and "CHANNEL B" for the right.
 - 3. The emitter shall provide left and right AUDIO IN jacks to accept an input signal from a sound system, left and right "SYNC IN/SYNC OUT" jacks for master/slave daisy-chaining

with other emitters if desired, and left and right "MIC-IN" jacks to accept an audio signal from a microphone or Audio/Video preamplifier.

4. The emitter shall provide separate LED input level detectors for each channel which illuminate when the audio signal peaks. Stereo and mono audio processing.
5. Emitter Mounting:
 - a. Portable mounted to a table-top-or floor-stand, using accessory support-stand adapter.
 - b. Each emitter shall provide an array of not less than 130 infrared LEDs covered by an infrared transparent acrylic lens. The infrared signal from each emitter shall cover not less than 3,000 square feet (32,000 cubic feet) enclosed space. Note: For room sizes smaller than 3,000-square feet, the infrared transmitter/emitter infrared output shall be reduced to accommodate the actual smaller room square feet size and height.
 - c. 120-volt 60Hz AC input to nominal 24-volt DC output (plug-in "power-brick") power supply external transformer shall be UL approved, with cable "plug-in" connection to emitter/transmitter. Provide remote system master on-off control.

C. Receiver Units

1. Battery Power

- a. Power for each unit operation shall be supplied by internal, changeable recharge-able NiCad batteries and alternately by alkaline disposable batteries. Rechargeable batteries shall be recharged without removal from the unit. Each unit shall have a charging indicator light. The batteries shall be recharged from either a portable charger/organizer and with wall transformer/two unit chargers. The units shall operate for up to 40-hours with alkaline batteries, and up to 15-hours with NiCad (NiMH) batteries.
- b. Provide power on-off control on each unit, to extend battery duration.
- c. A protection circuit shall prevent battery "back-drain" if the power to the charger is turned off while the unit is being recharged.
- d. The receiver shall be a dual-channel unit for wearing around the neck with an adjustable strap. Stereo and mono audio reception and processing.
- e. Compatible with the transmitter (emitter) and operate on 2.3 and 2.8MHz frequencies invisible infrared light waves. Self-contained and switchable from "CHANNEL A" to "CHANNEL B" through a switch located on the back of the unit.
- f. The receiver shall provide an infrared light-gathering lens on the front of the unit to focus the light signal from the emitter onto the infrared detector element. The receiver shall detect and decode the infrared emitter/transmitter light source within a 160-degree acceptance angle.
- g. Audio squelch circuit which turns the output circuit off when the infrared signal is reduced or not received, with on/off and volume control.
- h. Output jack, which accepts any of the listening accessories. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation.
- i. Shall be compact easily portable units, self-contained ABS/plastic housing/enclosure with red infrared receiver lens. Shall clip to pocket or belt.

D. Infrared System Accessories

1. Battery recharger portable charger/organizer pack.
 - a. Locking, portable case with cover, shall accept a group of not less than twelve plug-in portable transmitters and receivers units in each pack for simultaneous multi-unit battery recharging. Provide a quantity of one organizer for each quantity group of twelve (or fraction thereof) receivers provided as part of the Contract.
 - b. Stereo audio headset style automatic noise canceling microphones, integral on-off-volume control and with behind the neck support style. Each with 25-foot long extension cables and outlet plug-jacks to match transmitter outlet jacks. Provide two cables for each emitter/transmitter.
 - c. Equipment wall mount support brackets.
 - d. Auxiliary audio program source 15-foot long cables with plug-in at both ends to match transmitter jacks. Provide two for each transmitter.
 - e. Headset style ear phones with cable and plug to match receiver jacks. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation. Provide one headset for each receiver.
 - f. Rechargeable Ni-Cad (NiMH) batteries, one complete set for each unit.
 - g. Locking auxiliary equipment storage cases for cables, microphones and headsets. Quantity and capacity as required to store all accessories.
 - h. Portable floor stand, for infrared emitter/transmitter units mounting and support, with variable height adjustment and tip-resistant weighted base. Provide one floor stand for each infrared emitter/transmitter.
 - i. Locking, portable case for infrared emitter/ transmitter. One for each emitter/transmitter unit.
 - j. Provide microphone extension cable with plug to match microphone and infrared emitter/transmitter microphone input jack, 25-foot length. One for each microphone.

PART 3 EXECUTION

3.01 GENERAL

- A. Each System General
 1. Assemble, set up, and test each transmitter, receiver, and accessories units.
 2. Install and fully charge all batteries prior to and after testing/set up are complete.
- B. Wireless Infrared Units
 1. Provide aiming and intensity adjustments of emitter/transmitter units to insure complete room coverage.

3.02 SCHEDULE

	Room / Space	Occupant Load	No. of Transmitters	No. of Receivers	Hearing Aid Comp.
101	Computer Lab	66	Portable*	2	2
103	Computer Lab	73	Portable*	3	2
109	Collaboration Room	11	Portable*	2	2

110	Conference Room	26	1	2	2
115	Testing Classroom	49	Portable*	2	2
125	Academic Classroom	44	Portable*	2	2
126	Adult Basic Education	43	Portable*	2	2
127	Academic Classroom Finishes	43	Portable*	2	2
128	Collaboration Room	26	Portable*	2	2
143	Business Lab	44	Portable*	2	2
147	Art Classroom	73	Portable*	3	2
148	Academic Classroom	69	Portable*	3	2
149	Upholstry/Costume Design Classroom	86	Portable*	4	2
153	Needle Arts Classroom	72	Portable*	3	2
154	Academic Classroom	72	Portable*	3	2
157	Adult Basic Education	43	Portable*	2	2
Totals			3	8**	4**

*Two portable transmitters, shared for all classrooms.

**Eight receivers, shared for all classrooms. Four receivers to be hearing aid compatible.

END OF SECTION

SECTION 28 01 00

ELECTRONIC SAFETY AND SECURITY GENERAL PROVISIONS

ARTICLE 1 - SUMMARY

- 1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.
- 1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

END OF SECTION

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SECTION 28 30 00

FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 Work Included:

- 1.1.1 Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating fire alarm system.

1.2 Related Work:

- 1.2.1 Division 26 01 00: Electrical General Provisions
- 1.2.2 Division 26 05 33: Conduit and Fittings
- 1.2.3 Division 26 05 34: Outlet and Junction Boxes

1.3 The equipment and installation shall comply with the current applicable provisions of the following standards:

NFPA 72-2016. National Fire Alarm Code with California Amendments.
CBC - 2019. California Building Code (CBC), Part 2, Title 24, CCR.
CEC - 2019. California Electrical Code, (CEC), Part 3, Title 24, CCR.
CFC - 2019. California Fire Code (CFC), Part 9, Title 24, CCR.

1.4 The system and all components shall be listed by Underwriters Laboratories, Inc. for use in Fire Protective Signaling Systems under the following standards as applicable:

UL 38 Manually Actuated Signaling Boxes.
UL 50 Cabinets and Boxes.
UL 268 Smoke Detectors for Fire Protective Signaling Systems.
UL 268A Smoke Detectors for Duct Applications
UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
UL 464 Audible Signaling Appliances.
UL 521. Heat Detectors for Fire Protective Signaling Systems.
UL 864 Control Units for Fire Protective Signaling Systems.
UL 1481. Power supplies for Fire Protective Signaling Systems.
UL 1971. Visual Signaling Appliances.

1.5 Only Fire Alarm Control Panel Equipment and Peripheral Field Devices have been shown on the Contract Bid Single Line Block Diagram. Specific and complete wiring between Control Equipment and Peripheral Equipment has been deleted for clarity.

1.6 Submittal shall be made **in accordance with Division 26 01 00 – Shop Drawings and Submittals.** This submittal shall include the following:

- 1.6.1 Complete bills of quantities, including all materials, components, devices, and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each item listed:
 - 1.6.1.1 Quantity of each type of equipment item.
 - 1.6.1.2 Description of each item.
 - 1.6.1.3 Manufacturer's Name and Model Number.
 - 1.6.1.4 Manufacturer's Specification Sheet.
 - 1.6.1.5 California State Fire Marshall Listing Sheets for all components.
 - 1.6.1.6 Equipment items which have individual components, will require that all component parts be listed individually.
 - 1.6.1.7 Letter indicating the contractor's intent to comply with Phase II submittal drawings.
- 1.7 Phase II Submittal shall be provided **within (20) working days** after the approval of the Phase I submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered and drawn on a CAD System. Each submission shall include 'D' or 'E' size print copies to match the contract drawings, and one (1) data disk copy with files in a AutoCAD 2000i or 2004 format . Building floor plan CAD files on disk, will be made available via express mail after the receipt of payment of \$50.00 per building floor plan, or \$300.00 minimum which ever is less. Contractor shall make the request for drawings in writing directly to Johnson Consulting Engineers, confirmation of the request and a release form will be forwarded to the contractor to include a signed copy with payment prior to release of files. Detail or riser diagram sheets or any other drawings other than floor or site plans, will not be made available to the contractor.
 - 1.7.1 **Provide complete shop drawings to include the following:**
 - 1.7.1.1 Complete floor plans, at scale of contract documents, showing the locations throughout the project of all receptacles, conduits, wireways, tray, pullboxes, junction boxes, equipment racks, and other devices.
 - 1.7.1.2 Point to point wiring diagrams showing wiring from panel terminals to each device.
 - 1.7.1.3 Scaled floor plans indicating the location of devices, conduit runs, types, and number of conductors.
 - 1.7.1.4 Riser diagram indicating all wiring and circuits.
 - 1.7.1.5 Current State Fire Marshal listing sheets for all components and devices.

- 1.7.1.6 Provide battery power supply calculations, indicate point of power supply connection, means of disconnect, over-current protection, etc. for each panel.
- 1.7.1.7 Provide detailed information on conductors to be used- manufacturer, type, size, insulation, etc.
- 1.7.1.8 Provide voltage drop calculations for all conductor run is from each panel (i.e., main FACP, remotes, power extenders, etc.) for each panel.
- 1.7.1.9 Provide written sequence of system operation matrix.
- 1.7.1.10 Provide list of zones. (Every device that is addressable.)
- 1.7.1.11 Provide detailed drawing for annunciator panel indicating all zones and initiating devices.

1.8 Common submittal mistakes which will result in submittals being rejected:

- 1.8.1 Not including the qualifications of the installing contractor.
- 1.8.2 Not including all items listed in the above itemized description.
- 1.8.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
- 1.8.4 Not including actual manufacturer's catalog information of proposed products.
- 1.8.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.
- 1.9 All equipment and material shall be new and unused, and listed by Underwriter's Laboratories for the specific intended purpose. All control panel components and field peripherals shall be designed for continuous duty without degradation of function or performance. All equipment covered by this specification or noted on Installation. Drawings shall be equipment suited for the application and shall be provided by a single manufacturer or be recognized and UL listed as compatible by both manufacturers.
- 1.10 It will be the responsibility of the Contractor to ensure proper specification adherence for system operation, final connection, test, turnover, warranty compliance, and after-market service. The distributor of the equipment specified must be factory-trained and certified.
- 1.11 Basic System Functional Operation, upon operation of any automatic, manual or other initiation device the following shall occur:

- 1.11.1 The system alarm LED shall flash.
- 1.11.2 A local piezo electric signal in the control panel shall sound.
- 1.11.3 A backlit 80 character LCD display shall indicate all information associated with the fire alarm condition, including the alarm point and its location within the protected premises.
- 1.11.4 History storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
- 1.11.5 All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
- 1.11.6 LED display and audible signaling at the remote annunciator indicating building, fire zone, and type of device. Annunciator shall also provide a separate audible signal for CO detection with a green flashing light, with classroom number indication.
- 1.11.7 Automatic retransmission to a UL central station for fire department notification.
- 1.11.8 Automatic shut down of air conditioning units and/or smoke dampers furnished with duct detectors. Each building shall shut down all A/C units and dampers within that building as one zone.
- 1.12 All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protective signaling system, meeting the NFPA 72, 2016 Edition with California State Amendments.
- 1.13 All equipment and components shall be installed in strict compliance with manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- 1.14 All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. Fasteners and supports shall be adequate to support the required load.
- 1.15 All wiring shall be installed in a conduit system.
- 1.16 The contractor shall provide as a part of this contract additional control modules, heat detectors, smoke detectors, CO detector, duct detectors, manual pull stations, strobes, mini-horns and exterior horn devices etc., to equal 10% of the total quantity of devices shown on the drawings, or a minimum of three (3) for each type, whichever is greater. Installation of conduit, boxes and wiring of these devices shall be included, and required

locations coordinated with CSFM final approved shop drawings. Any devices not required to be included during construction shall be delivered to the District at the completion of the project. The quantities of these devices shall be listed as a part of the Phase I submittals.

- 1.17 The installing contractor shall provide a copy of current documentation, indicating that the contractor installing the fire alarm systems or devices and wiring, is certified by Underwriters Laboratories (UL) in its product directories under the listing category "PROTECTIVE SIGNALING SERVICES - LOCAL, AUXILIARY, REMOTE STATION, AND PROPRIETARY." The contractor shall be certified by the manufacturer to install and program the system. The contractor must also provide complete installation of all wiring and equipment, and software programming. Supervised installation of the wiring, devices and/or any software programming shall not be permitted.
 - 1.17.1 The installing contractor must also be an "authorized dealer" by the equipment manufacturer and must have completed all required training prior to the bid of this project.
 - 1.17.2 The fire alarm system installation shall be warranted by the manufacturer's representative.
 - 1.17.3 The Contractor shall have a current California C-10 or C-7 Contractor's License, and all individuals working on this project shall have passed the Department of Industrial Relations Division of Apprenticeship Standards – "Fire / Life Safety Certification Program."
 - 1.17.4 The installing contractor shall provide, at the time of submittal, a letter of intent to provide an extended service warranty. This warranty shall extend for a total of three (3) years, starting at the completion, testing, and training of this project. The service warranty shall cover all material and labor to keep operational all system devices installed under this project, and shall include two (2) complete U.L. system's tests and cleaning of all devices at year two (2) and year three (3) of the warranty. Routine cleaning of devices, other than at the two (2) specified U.L. system's testing periods, will not be included as a part of this warranty.
 - 1.17.5 The installing contractor shall provide, at the time of submittal, a letter indicating that the installation crew for this project meets the following NICET certifications:
 - 1.17.5.1 25% of the installing field personnel must have completed NICET Level 2 Certification.
 - 1.17.5.2 One of the installing field personnel and /or supervisor must have completed NICET Level 3 Certification.

1.17.5.3 Contractor shop drawings shall be signed by an individual who has completed NICET Level 4 Certification.

1.18 All conduit and standard backboxes will be furnished and installed by the Division 26 Contractor. Specialty boxes will be furnished by the equipment supplier to be installed by the Division 26 Contractor.

1.19 Equipment and materials shall be the standard product of FCI.

Alternate equipment as manufactured by any other manufacturer not specifically listed above will not be approved for use on this project. D.S.A approved drawings are included as a part of the drawing set

PART 2 - PRODUCTS

2.1 Main Fire Alarm Control Panel

2.1.1 Fire alarm control panel is EXISTING FCI E3.

2.1.2 The system shall be controlled and supervised by a microprocessor-based monitoring fire alarm control panel. The systems shall be addressable, field configurable, programmable and editable. The system shall continuously scan devices for change of status. Each device shall have its own unique address but shall also be grouped by building as a separate zone for remote annunciation and alarm report purposes.

2.1.3 The system shall be provided with a networking card and software and modem to communicate with the District-wide diagnostic and annunciation network.

2.1.4 The fire alarm control panel shall be housed in a lockable, code gauge steel cabinet with 80 character LCD display, master controller operators panel, Indicating lamps, silence switch and reset switch mounted on cabinet front. The fire alarm control panel shall be physically and visually located in the general office for monitoring by staff, and shall sound the "Temporal Pattern" in all zones. Signal duration shall be field programmable and initially set at three minutes. Provide all control modules, synchronous modules, etc., to provide a complete working system per all codes that apply.

2.1.5 The fire alarm control panel shall come with standardized software for on-site customization of the system. The unit shall be capable of providing a 600-event historical log with zone or point selectable alarm verification.

2.1.6 The unit shall support 127 addressable points per module and one output point, SPST contact per zone. Provide the number of modules necessary to control and supervise fire alarm devices as shown on the Drawings, as well as to provide 25% spare capacity.

- 2.1.7 The fire alarm control panel shall be capable of providing a walk test.
- 2.2 The power feed for the FACP shall be 3-wire, 120volt, AC, single phase (20A circuit) permanently labeled "FIRE ALARM CONTROL POWER", terminating at the master fire alarm control and supervisory panel. The label shall be red with 1/4" high white lettering. The source circuit breaker must be provided with a lock-on device.
- 2.3 In addition to the AC circuit, the panel shall be equipped with a DC battery to activate an audible alarm and pilot light in case of a power failure on the AC circuit.
- 2.4 Batteries must drive signaling devices per current requirements of California State Fire Marshal. Battery calculations are required as part of the submittal.
- 2.5 The master fire alarm panel shall be equipped with a manual pull lever type, supervised report station.
- 2.6 With the exception of the manually operated report station required at the master fire alarm panel and large assembly areas, the remainder of the school facility shall be equipped with approved, electronically supervised, automatic fire detection devices, such that every room, space, including concealed spaces, such as the attic spaces above ceilings, etc., is provided with approved coverage.
- 2.7 Automatic fire detection devices shall be addressable analog smoke and heat detectors. Where used, heat detectors shall be fixed temperature x-rate of rise, fixed at 135°F and a 15°F/min rate of rise. In janitor rooms equipped with kilns, devices shall be fixed at 170°F.
- 2.8 MANUAL FIRE ALARM STATIONS shall be addressable test-reset lock in order that they may be tested, and so designed that after actual emergency operation, they cannot be restored to normal, except by use of a key. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet, front or side. Manual stations shall be constructed of die-formed, satin-finished aluminum, with operating directions provided on the cover in depressed red letters. The word FIRE shall appear on each side of the stations in depressed letters, 1/2-inch in size or larger. Stations shall be suitable for semi-flush mounting on a standard single-gang box or switch plate, and shall be provided with a terminal block for connection of fire alarm system wiring. Manual pull stations must comply with CBC sections 11B-309 and 11B-403.
- 2.9 HORN / STROBE DEVICE shall be of the semi-flush type designed for mounting to a standard four-inch square electrical outlet box. Each device shall be provided with a semi-flush accessory plate. Exterior horns shall be weatherproof. The strobe unit shall have a meantime between failure (MTBF) of 1,000 hours or greater. The strobe section shall have a minimum flash rate of approximately one flash per second, with candela rating as per UL standard 1971. Housing shall be white.

- 2.9.1 In areas containing two or more audible devices, or three or more visual devices, these devices shall be synchronized, Per NFPA 72, Chapter 18 California Amendments (2019).
- 2.10 STROBES. The strobe unit shall have a meantime between failure (MTBF) of 1,000 hours or greater. The strobe section shall have a minimum flash rate of approximately one flash per second, with candela rating as per UL standard 1971. Housing shall be white.
- 2.10.1 In areas containing two or more audible devices, or three or more visual devices, these devices shall be synchronized, per NFPA 72, Chapter 18 California Amendments (2019).
- 2.10.2 Maximum pulse duration to be 0.20 of a second with an ADAAG 4.28.3(3). Visual alarms maximum duty cycle of 40%.
- 2.10.3 Capable of providing minimum candela. Intensity as shown on plans (effective strength measured at the source).
- 2.10.4 The flash rate to be a minimum of 1.Hz and a maximum of 2 Hz per NFPA 72 18.5.3.1.
- 2.11 HEAT DETECTOR DEVICES shall be addressable, fixed temperature x rate of rise, fixed at 135°F and a 15°F/min rate of rise. In janitor rooms equipped with kilns, devices shall be fixed at 170°F.
- 2.12 SMOKE DETECTOR DEVICES shall be analog addressable, photo-electric.
- 2.13 CO – CARBON MONOXIDE detectors shall be provided in all Group E Classrooms and provided with a sounder base to alarm individual classrooms with a 4-pulse temporal pattern as well as transmitting to the staffed remote annunciator.
- 2.14 DUCT TYPE DETECTORS shall be analog addressable, photo-electric type, provide with remote test switch and auxiliary contacts as required for control of A/C units or smoke dampers.
- 2.15 DIGITAL ALARM COMMUNICATOR TRANSMITTER. The control panel shall have the ability to meet the requirements of UL 864 for central station connections, and shall be UL listed for use with the fire alarm control panel. The communicator shall be connected to supervise two telephone lines, all wiring required for this connection shall be provided by the fire alarm contractor Coordinate interface with District monitoring company as required.
- 2.16 REMOTE ANNUNCIATOR shall be an 80 character backlit, alphanumeric, LCD readout display. The display shall include alarm, supervisory, CO detection and trouble condition LEDs and tone alert. Each condition shall have a dedicated acknowledge push button switch to silence the local tone alert but leaves the LED lights on until all conditions have been restored.

- 2.17 VOICE EVACUATION shall be provided in all group A Occupancies with an occupancy load of 1,000 or more and shall be activated by the fire alarm system. Voice communication system shall be CFSM listed and approved. System shall provide an approved prerecorded message announcement that is audible above the ambient noise.

PART 3 - EXECUTION

- 3.1 All wiring shall be (min) #18 AWG copper or as noted on drawings. All underground conductors shall be UL wet location rated for use in wet locations, West Penn "Aquaseal" or equal. There shall be no splices in underground handholes or vaults. A multi-conductor cable rated for use in wet locations will also be acceptable. It must be labeled "FIRE ALARM" in all pull boxes, using a water-tight labeling system.
- 3.2 Interior, dry location wiring for low voltage initiating circuits shall be #18 AWG copper, twisted shielded pair minimum, signaling circuits shall be No. 14 AWG minimum, and wiring for 120 volt circuits shall be No. 12 AWG minimum. All wiring shall be color coded, solid copper conductor. Use of power limited cable shall be restricted to controls listed for this purpose. Single conductors shall be type THHN/THWN-2 insulated copper.
- 3.3 Wire markers shall be provided for each wire connected to equipment. The marker shall be of the taped bank type, of permanent material, and shall be suitable and permanently stamped with the proper identification. The markers shall be attached in a manner that will not permit accidental detachment. Changing of wire colors within circuits shall be unacceptable.
- 3.4 A terminal cabinet shall be installed in the electric room for the fire alarm systems at each building. All fire alarm wiring shall terminate on UL approved strips in this terminal cabinet. All wiring shall be labeled at each termination strip. Wiring shall be configured such that all end-of-line resistors will be installed at the terminal cabinet.
- 3.5 Fire Sprinkler Activation detecting System(s) shall each be indicated on a separate zone in the fire alarm control panel.
- 3.6 Fire Alarm Control Panel and all other equipment shall be mounted with the center of all operable reset buttons, located a maximum of 48" front approach / 54" side approach above floor level.
- 3.7 Contractor shall provide complete wiring between all equipment.
- 3.8 The Fire Alarm/Life Safety Installation shall comply fully with all Local, State and National Codes, and the Local Authority Having Jurisdiction (AHJ) DSA.
- 3.9 The Fire Alarm Control Panel and power supply shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main Power Distribution Panel as FIRE ALARM CIRCUIT.

- 3.10 The Control Panel Cabinet shall be grounded securely to a power system ground conductor. Provide a 1/2-inch conduit and 1#12 grounding conductor to the building electrical service ground bus.
- 3.11 Conduit shall enter into the Fire alarm Control Panel back box only at those areas of the back box which have factory conduit knockouts.
- 3.12 All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; an audible and visual trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
- 3.13 All cables and wiring shall be listed for Fire Alarm/Life Safety use, and shall be of the type as required by and installed per CEC Article 760.
- 3.14 Final System Acceptance
 - 3.14.1 Provide an NFPA Certificate of Compliance to DSA, the School District and Local Fire Marshall. Complete fire alarm system shall comply with and be sound-tested for a "Temporal Pattern" in all zones.
 - 3.14.2 Beam detectors shall be tested by two methods:
 - 3.14.2.1 Manual slow cover test to confirm reflector alignment is correct.
 - 3.14.2.2 Software fire test per UL268.5 to demonstrate when signal level is reduced simulating obstruction the detector will go into alarm.
 - 3.14.3 The system will be accepted only after a satisfactory test of the entire system has been accomplished by a Factory-Trained Distributor in the presence of a representative of the authority having jurisdiction and the Owner's representative. This contractor shall provide all personnel, ladders and testing equipment to assist the local authority in completing this test. Actuate each device and verify that the system performs as specified.
 - 3.14.4 The Contractor will present a complete set of "as-built" Fire Alarm/Life Safety system drawings, and the factory supplied Operator's Manuals as required by the General Provisions section of this specification.
 - 3.14.5 Once the system has been tested and the certificate of compliance completed, the contract shall not be considered complete until after owner training has been completed. The contractor shall notify in writing their intent to provide the training for the system. This notification shall be given to the Division 21 Contractor, Architect and the Project Engineer a minimum of 2 weeks prior to the scheduled training session. The Division 21 Contractor and/or the architect shall be responsible for notifying the owner to confirm that the appropriate District personnel will be made available for this training session. If the Division

21 Contractor does not receive confirmation that the training session can be performed on the proposed date, than another time shall be provided. The training shall consist of the following:

- 3.14.5.1 Provide a minimum of one (1) four-to-six -hour training period located at the project site, to instruct District personnel in proper operation of all systems.
- 3.14.5.2 Provide a minimum of three (3) complete owner operation manuals for the District records.
- 3.14.5.3 Provide a minimum of two (2) complete as built sets of drawings for the District records.
- 3.14.5.4 Provide all spare parts as described in part 1 of these specifications
- 3.14.5.5 Provide written confirmation and proposed scheduled dates for follow up training and 1 year complete system test.

3.15 Follow up Training

- 3.15.1 Provide as a part of this contract, the follow up instructional training period within six (6) months after the final acceptance of the systems. This training shall include a minimum of one four-to-six-hour training period to instruct District personnel in proper operation of all systems and shall instruct the District technicians how to repair any non-operational parts of the system as required. All defective parts shall be replaced at no cost to the owner.

END OF SECTION

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SECTION 31 23 16.13

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling and compacting for utilities from 5 FEET outside the building to connection point on-site, where indicated on Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 01 41 00 - Regulatory Requirements: Code Compliance.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)).
- F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.05 COORDINATION OF SPECIFICATION REQUIREMENTS

- A. Coordinate these Specification Section requirements with specifications included on Drawings. Comply with more stringent requirements and with those requirements of the authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
- B. Structural Fill: Subsoil excavated on-site.
 - 1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- C. Concrete for Fill: Lean concrete.
- D. Granular Fill - Gravel: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM C136/C136M, within the following limits:
 - a. 3/4 inch sieve: 95 to 100 percent passing.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect plants, lawns, rock outcroppings, and other features to remain.
- E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 TRENCHING

- A. Excavate subsoil required for conduits, storm drain, sanitary sewer, water and gas piping to municipal utilities.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Trenches Parallel to Footings: Do not place the trench below a 1 vertical to 2 horizontal from 9 inches above the bottom edge of the footing and no closer than 18 inches from the face of footing. CBC Section 1809A.14.

- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Cut trenches wide enough to allow inspection of installed utilities.
- G. Hand trim excavations. Remove loose matter.
 - 1. Hand trim for bell and spigot pipe joints.
- H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume.
- J. Remove excavated material that is unsuitable for re-use from site.
- K. Stockpile excavated material to be re-used in area designated on site.
- L. Remove excess excavated material from site.
- M. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- N. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.
- D. Support pipe and conduit during placement and compaction of bedding fill.

3.05 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage installed piping and conduits, or other work.
- D. Systematically fill and compact as as to achieve 90 percent relative compaction without damaging conduit or pipe. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth or as directed by the Geotechnical Report.
- H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
 - 1. Thrust bearing surfaces: Fill with concrete.

2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 or 95 percent of maximum dry density as applicable for the fill area.
- J. Compaction Density Unless Otherwise Specified or Indicated:
 1. Under paving and similar construction: 95 percent of maximum dry density.
 2. At other locations: 90 percent of maximum dry density.
- K. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Utility Piping:
 1. Bedding: Use Fill Type SP or SW (ASTM D2487) or SM with sand equivalent of 30 or greater per ASTM D2419, 3 inches thick, compacted to 90 percent..
 2. Cover with Fill Type SP, SW, SM, GM per ASTM D2487.
 3. Fill up to subgrade elevation.
 4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.07 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1.2 inch from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1.2 inch from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Control, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556 or ASTM D6938.
- C. Correct unauthorized excavation at no cost to District.
- D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").
- E. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to District.

3.09 CLEANING

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

3.10 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 50 00 - Temporary Construction Facilities and Controls.

- B. Recompect fills subjected to vehicular traffic.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Single course bituminous concrete paving.
- C. Double course bituminous concrete paving.
- D. Surface sealer.
- E. This section compliments and shall be coordinated with Civil Drawing specifications / requirements. The most stringent requirements shall be utilized.
- F. Asphaltic concrete paving for vehicular traffic and curbs, including necessary patching and repair of damaged new and existing paving.
- G. Patching and repair of existing asphaltic concrete paving for previous damage, for underground utility work and where damaged by new construction.
 - 1. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.
 - 2. Areas heaved by tree roots, cracked areas, holes, and trenches.
- H. Asphalt concrete paving work as indicated on Drawings at athletic running track.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 23 - Fill: Compacted subgrade for paving.
- B. Section 32 17 13 - Parking Bumpers: Concrete bumpers.
- C. Section 32 17 23.13 - Painted Pavement Markings:
 - 1. Parking and Traffic Control Pavement Markings.

1.03 REFERENCE STANDARDS

- A. AI MS-2 - Asphalt Mix Design Methods.
- B. AI MS-19 - Basic Asphalt Emulsion Manual.
- C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
- D. SSPWC (Greenbook) - Standard Specifications for Public Works Construction.

1.04 SUBMITTALS

- A. Materials List: List source and quality standard for all asphaltic concrete materials.
- B. Mix Design:
 - 1. Formulate a job-mix formula using the Hveem method in accordance with SSPWC (Greenbook) Section 203-6.2 and submit for approval.

2. Submit designs for asphaltic concrete prepared by a materials laboratory under direct supervision of a Civil Engineer licensed in the State of California or a standard mix design proven in actual performance.
 3. Resultant Mixture: Hveem properties conforming to SSPWC (Greenbook) Section 203-6.4.3.
- C. Certifications:
1. Weighmaster's Certificates or certified delivery tickets for each truckload of bituminous material delivered to site.
 2. Certificates of Conformance: Asphalt, aggregate and sterilant materials.
 - a. 20 days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, submit certificates and test results of compliance of such materials with these specifications.
 - b. Submit certificates of compliance from the supplier for bituminous materials for paint binder, asphaltic concrete, and seal coat.
 - c. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.
 - d. Upon completion of the weed control treatment, and as a condition for final acceptance, furnish a written certificate stating the brand name of the sterilant and the manufacturer, and that the sterilant used had at least the minimum required concentration, and that the rate and method of application complied in every respect with the conditions and standards contained herein.
- D. Samples:
1. Prior to the delivery of specified aggregate to the site, submit samples of the material for the Inspector's acceptance in accordance with SSPWC (Greenbook) Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.
 2. Provide aggregate base gradation and quality certifications, dated within 30 days of submittal.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with locally adopted SSPWC (Greenbook).
- B. Mixing Plant: Conform to Locally adopted SSPWC (Greenbook).
 1. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete.
 2. Applicator Qualifications: Paving machine and roller operators shall be fully trained and experienced in the installation of asphaltic concrete paving on projects of similar size and complexity.
- C. Testing and analysis of granular base material and asphaltic concrete paving mix shall be performed under provisions of Division 01.
- D. Obtain materials from same source throughout.

1.06 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen; or when rain is imminent.
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with applicable code for paving work on public property.
- B. Where reference is made to SSPWC (Greenbook), the following shall apply.
 - 1. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction, including Standard Details for Public Works Construction, as amended and adopted by those authorities.
 - 2. Perform on-site Work as indicated and referenced on Contract Drawings and as specified herein.
- C. The quantity of volatile organic compounds (VOC) used in weed killer, seal coat, tack coat, primer, and other materials shall not exceed limits permitted under current regulations of local Air Quality Management District (AQMD).

2.02 MATERIALS

- A. General: Aggregate base, prime coat paint binder, bituminous surface course and other materials shall be as noted on the Contract Drawings and shall comply with requirements of authorities having jurisdiction.
- B. Asphalt Cement: ASTM D 946.
- C. Asphalt Concrete Materials: SSPWC (Greenbook), Subsection 203-6.
- D. Aggregate for Base Course:
 - 1. Crushed Aggregate Base in accordance with SSPWC (Greenbook), Subsection 200-2.2.
- E. Aggregate for Binder Course : Angular crushed washed stone; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM D2487 Group Symbol GW.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.
- H. Tack Coat: Homogeneous, medium curing, liquid asphalt.

- I. Seal Coat: AI MS-19, slurry type.
 - 1. Asphalt Emulsion, www.aema.org, SS1-h, per SSPWC (Greenbook) Section 203-9.
 - 2. Acceptable Manufacturers:
 - a. Blue Diamond Asphalt; Satin Seal: www.bluediamondasphalt.com.
 - b. Diversified Asphalt Product; Over Kote: www.diversifiedasphalt.com.
 - c. Gold Star Asphalt Products: goldstarsphalt.com
 - d. SealMaster Pavement Products & Equipment; MasterSeal: sealmaster.net.
 - e. Vulcan Materials Company; GuardTop: www.vulcanmaterials.com.
 - f. Western Colloid Products; Park Top: www.westerncolloid.com.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Asphalt Surfacing Materials: Provide asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant.
- B. Use dry material to avoid foaming. Mix uniformly.
- C. Base Course: 4.5 to 5.8 percent of asphalt cement by weight in mixture in accordance with SSPWC (Greenbook) Section 203-6.4.3, Type B.
- D. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
 - 1. CSS-1 h and conform to the requirements of SSPWC (Greenbook), Section 203-3 Emulsified Asphalt.
- E. Parking Lot Wearing Course: 4.6 to 6.0 percent of asphalt cement by weight in mixture in accordance with SSPWC (Greenbook) Section 203-6.4.3, Type C2.
 - 1. Provide at least two courses of asphalt when Type C2 asphalt pavement is greater than 3 inches.
 - 2. Surface Course Minimum Thickness: 1 inch and a maximum of 2 inches.
- F. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.04 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.
- B. Submit asphaltic concrete mix design proposed by the Contractor to the Engineer for review.
- C. Proposed mix to be tested for conformance with the specifications, including grading, asphalt content and stability.

2.05 ACCESSORIES

- A. Headers and Stakes:
 - 1. 2 x 6 inch nominal Redwood, Construction Heart Grade, or preservative treated douglas fir (PTDF), except at curves provide laminated 1 x 6 inch nominal PTDF, unless indicated otherwise on Drawings
 - 2. Stakes: 2 x 4 x 18 inch long Redwood, or 2 x 3 x 18 inch long PTDF; at 48 inch on center maximum.

3. Nails: Common, use hot dipped galvanized only, 12d minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade and granular base is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Fine grading, checking, shaping, and compacting of subgrade shall be complete before start of asphaltic concrete Work.
- D. Soil Sterilant: Sterilize soil areas to receive asphaltic concrete paving. Apply soil sterilant in accordance with manufacturer's instructions and applicable environmental regulations. Take care to confine application to the areas to be paved. See Section 32 11 23 - Aggregate Base Courses for product information.
- E. Headers: Place headers with tops flush with finish asphaltic concrete surfaces. Back headers with stakes.
 1. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
 2. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
 3. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.
 4. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
 5. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
 6. Provide additional stakes and anchorage as required to fasten headers in place
- F. Do not asphalt concrete on any surface, which contains ponded water or excessive moisture in the opinion of the Architect or consulting engineer.
 1. If paving operations are in progress and rain or fog forces a shut down, loaded trucks in transit shall return to the plant, and no compensation will be allowed therefore.
 2. Provide canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing.

3.02 PAVEMENT REPAIR REMOVAL

- A. Remove bituminous and concrete pavement in accordance with applicable provisions of SSPWC (Greenbook) Section 300 - Earthwork.
- B. Pavement Heaved By Roots:

1. Remove pavement to limits of distortion and expose roots.
 2. Trim roots to provide at least 12 inch clearance to pavement.
- C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.
 - D. Remove raveled and depressed bituminous pavement to limits indicated or required.
 - E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.
 - F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

3.03 EXCAVATING, BACKFILLING AND COMPACTING FOR REPAIR

- A. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

3.04 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade.
 1. Where excavation for headers is undercut, thoroughly tamp soil under the header.
 2. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.
- C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches.
 1. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers.
 2. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header.
 3. Provide a minimum of two 12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and devices as required to fasten headers.

3.05 BASE COURSE

- A. Place and compact base course.
- B. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.
- C. Inspector will examine the base before the paving has begun. Correct any deficiencies before the paving is started.

- D. Wherever asphaltic pavement does not terminate against a curb, gutter, or another pavement, provide and install a redwood or pressure treated Douglas fir header at the line of termination.

3.06 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with SSPWC (Greenbook) Section 302-5.4.
- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 0.10 gal/sq yd.
- C. Apply tack coat to contact surfaces of curbs, gutters and previously placed or existing paving.
- D. Joining Pavement: Expose, cut and clean edges of existing pavement to straight, vertical surfaces for full depth of existing pavement.
 - 1. Paint edge with asphalt emulsion before placing new asphaltic concrete.
 - 2. Joints in New Paving: In accordance with SSPWC (Greenbook).

3.07 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install Work in accordance with SSPWC (Greenbook) Subsection 302-5.
- B. Asphalt concrete of the class indicated in Part 2 shall be laid in courses conforming to SSPWC (Greenbook) Table 302-5.5(A), unless otherwise stated herein.
- C. Place asphalt within 24 hours of applying primer or tack coat.
- D. Place thickness as indicated on Civil Drawings to minimum 1 inch compacted thickness.
 - 1. Asphalt concrete work shall include full depth patching and variable thick asphalt concrete transition areas.
 - 2. Provide daily the Inspector, with copies of certificates of weight for all materials delivered to the job site and/or incorporated in the work.
 - 3. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position.
 - 1. Compact (roll) asphaltic concrete in accordance with SSPWC (Greenbook), Subsection 302-5.6, using machine rollers.
 - a. Compaction by vehicular traffic is prohibited.
 - b. Compact areas inaccessible to rolling equipment with machine-powered tamper.
- F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.08 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- A. Provide at least two courses of asphalt when Type D2 asphalt pavement is greater than 1-1/2 inches. The surface course shall be a minimum thickness of 1 inch and a maximum of 1-1/2 inches.
- B. Provide at least two courses of asphalt when Type C2 asphalt pavement is greater than 3 inches. The surface course shall be a minimum thickness of 1 inch and a maximum of 2 inches.
- C. Install Work in accordance with SSPWC (Greenbook) Subsection 302-5.

- D. Place asphalt binder course within 24 hours of applying primer or tack coat.
- E. Place binder course to thickness as indicated on Civil Drawings, minimum 1 inch compacted thickness.
- F. Place wearing course within two hours of placing and compacting binder course.
- G. Place wearing course to thickness as indicated on Civil Drawings, minimum 1 inch compacted thickness.
- H. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.
- I. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position.
 - 1. Compact (roll) asphaltic concrete in accordance with SSPWC (Greenbook), Subsection 302-5.6, using machine rollers.
 - a. Compaction by vehicular traffic is prohibited.
 - b. Compact areas inaccessible to rolling equipment with machine-powered tamper.
- J. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.09 SEAL COAT

- A. Apply seal coat after surface course application, in accordance with manufacturer's recommendations.
- B. Apply seal coat to surface course and asphalt curbs in accordance with SSPWC (Greenbook), Subsection 302-8.2.
- C. Add water to specified seal coat material. When air temperatures of 90 degrees F or more are encountered during application, consult manufacturer for recommendations.
- D. If pavement surface exhibits imperfections of roller marks, rock pockets, ridges or depressions as determined by the Architect, the addition of sand aggregate to seal coat, and amounts thereof, shall be as recommended by the manufacturer.
- E. A second application shall be made after first coat has dried to the touch. When sand is added to the first seal coat, two additional coats without extra sand shall be applied.
- F. Allow seal coat to dry before permitting traffic or striping.

3.10 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/2 inch.

3.11 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.
 - 1. Flood test entire area in presence of the Project Inspector.
 - 2. Entire area tested to be free of standing water or puddles.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.
 - 1. After final rolling, prohibit all traffic on asphaltic concrete until mix has fully cooled and set. Minimum time, in all cases shall be 6 hours.

3.13 CLEANING

- A. After completion of paving operations, clean all existing and new improvements that have been soiled, especially by oil tracking from asphalt tanks or placement in general.
- B. For Substantial Completion review, broom clean and wash paving with hoses. Clean residue from landscaping installation.

END OF SECTION

SECTION 32 13 13

SITE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks and general site applications.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 92 00 - Joint Sealants: Sealing joints.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 301 - Specifications for Structural Concrete.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- D. ACI 305R - Guide to Hot Weather Concreting.
- E. ACI 306R - Guide to Cold Weather Concreting.
- F. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- G. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- I. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- M. ASTM C150/C150M - Standard Specification for Portland Cement.
- N. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- P. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- R. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

- S. SSPWC (Greenbook) - Standard Specifications for Public Works Construction.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.

1.05 QUALITY ASSURANCE

- A. Lines and Levels: Established by State of California licensed Surveyor or registered Civil Engineer. Costs of surveying services shall be included in the Contract Sum.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

- A. Comply with applicable requirements of ACI 301.
- B. Concrete Sidewalks: 4,000 psi 28 day concrete, thickness as indicated on Drawings, minimum 4 inches, natural grey color Portland cement.

2.02 REGULATORY REQUIREMENTS:

- A. Conform to California Code of Regulations (CCR), Volume 2, Part 2, Chapters 18 and 19.
- B. Conform to California Building Code (CBC), Chapter 11B and ADA Standards for accessibility requirements.
 - 1. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
 - 2. Concrete paving and concrete finishes along accessible routes of travel shall be at least as slip-resistant as that described as a medium salted finish for slopes of less than 6%, and slip resistant at slopes of 6% or greater; CBC 11B-403.2.
 - 3. Accessible routes of travel, walks, paving, and sidewalks, shall have a continuous common surface with minimum width of 48 inches per CBC 11B-403.5.1, not interrupted by steps or by abrupt changes in level.
 - a. CBC 11B-303.2 Vertical: Changes in level exceeding 1/4 inch high maximum shall be permitted to be vertical and without edge treatment.
 - b. CBC 11B-303.3 Beveled: Changes in level between 1/4 inch high minimum and 1/2 inch high maximum shall be beveled with a slope not steeper than 1:2.
 - 4. Surface cross slopes shall not exceed 2 percent on any accessible path of travel.
- C. Albedo Reflectance of Finish Concrete: 0.30, minimum.

2.03 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 1/2 inch.

2.04 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.
- B. Dowels: ASTM A615/A615M, Grade 60 - 60,000 psi yield strength; deformed billet steel bars; unfinished finish.
- C. Provide supports for reinforcement to position the bars at mid depth of the concrete. Plastic and/or steel chairs, and dobies are acceptable.

2.05 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Sulfate Resistant - Type V Portland cement, gray color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- D. Water: Clean, and not detrimental to concrete.
- E. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.06 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1-D, Class A.
 - 1. Comply with all applicable air pollution requirements.
- B. Liquid Surface Sealer:
 - 1. High solids, acrylic curing and sealing compound: Minimum 30% non-yellowing, acrylic solids curing compound; shall conform to ASTM C309 and ASTM C1315, Type I, Class A, VOC compliant.
 - a. Acceptable Products:
 - 1) L&M Construction Chemicals, Inc.; Dress & Seal WB: www.lmcc.com.
 - 2) L.M. Scofield Company; Cureseal-W: www.scofield.com.
 - 3) W. R. Meadows Company; Decra-Seal W/B: www.wrmeadows.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 - 1. Material: Closed-cell, non-absorbent, compressible polymer foam in sheet form.

2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; As scheduled.
 - 2. Water-Cement Ratio: Maximum 40 percent by weight, or according to indicated concrete strength..
 - 3. Maximum Slump: 4 inches.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION

- A. Project Conditions:
 - 1. Water and Dust Control: Maintain control of concrete dust and water at all times. Do not allow adjacent planting areas to be contaminated.
- B. Moisten base to minimize absorption of water from fresh concrete.
- C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.03 COORDINATION WITH EXISTING CONSTRUCTION

- A. Connection to Existing Construction: Where new concrete is doweled to existing construction, drill holes in existing concrete, insert steel dowels and pack with non-shrinking grout.
- B. Preparation of Existing Concrete: Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
 - 1. Locate reinforcement to provide required cover by concrete. If not otherwise indicated on Drawings, provide concrete cover in compliance with ACI 318.

2. Reinforcement Supports: Provide load bearing pads under supports or provide precast concrete block bar supports.
- B. Interrupt reinforcement at contraction and expansion joints.
- C. Place dowels to achieve pavement and curb alignment as detailed.
 1. Secure tie dowels in place before depositing concrete.
 2. Provide No. 3 bars, 18 inch long at 24 inches O.C. for securing dowels where no other reinforcement is provided.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
 1. Mixing: If batch plant is within travel time not exceeding maximum limits, transit mix concrete in accordance with ASTM C94/C94M. If travel time exceeds limits, provide alternative means for mixing and submit for review and approval.
- B. Do not place concrete when base surface is wet.
- C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.08 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 1/2 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 2. Secure to resist movement by wet concrete.
 3. If expansion joints are not indicated, conform to SSPWC (Greenbook) and standard details and specifications of authorities having jurisdiction.
- C. Provide scored joints.
 1. Tooled Joints: 1-inch deep by 3/16-inch wide tooled joints with 1/8-inch radius corners.
 2. At 5 feet intervals for pedestrian paving.
 3. At 10 feet intervals for vehicle paving.
 4. Between sidewalks and curbs.
 5. Between curbs and pavement.

- D. Provide keyed joints as indicated.
- E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.09 FINISHING

- A. Sidewalk Paving: Medium broom, texture perpendicular to pavement direction with troweled and radiused edge.
- B. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- C. Specific Finishes: Where indicated on Drawings.
 - 1. Concrete Paving Finish: ACI 301, two-step trowel finish, followed after surface has achieved initial set by flooding of surface and light rubbing with bristle brush so that concrete fines are exposed slightly.
 - a. Finish surface less than 6 percent shall receive medium broom finish resembling medium grit sandpaper. CBC 11B-403 and 11B-302.1.
 - b. Finish surface greater than 6 percent shall receive heavy broom finish. CBC 11B-403 and 11B-302.1.
 - c. Surfaces shall have static coefficients of friction of 1.3 to 1.6 (dry) and 1.2 to 1.4 (wet) when field tested in accordance with ASTM D2047.
- D. Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.10 TOLERANCES

- A. ACI 301, Class B, except paving in public rights-of-way shall conform to SSPWC (Greenbook).
- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- C. Maximum Variation From True Position: 1/4 inch.
- D. Control-joint grooves and other conspicuous lines:
 - 1. 1/4 inch maximum in any 20 feet.
 - 2. 1/2 inch maximum in any 40 feet.
- E. Variation in Cross-Sectional Thickness of Slabs:
 - 1. Minus 1/4 inch.
 - 2. Plus 1/2 inch.
- F. Variation in Radii
 - 1. In radii of less than 10 feet:
 - a. 1/8 inch in any 5 feet.
 - b. 1/4 inch in any 10 feet.
 - 2. In radii of 20 feet:
 - a. 1/4 inch in any 10 feet.
 - b. 3/8 inch in any 20 feet
 - 3. In radii of 30 feet or more:
 - a. 1/2 inch in any 20 feet.

- b. 1 inch in any 30 feet.
- G. Coefficient of Friction for Finish Surface:
 - 1. Pedestrian Vehicular Finish Surface: Minimum 0.6 static coefficient of friction is required for all concrete paving finish surface. All concrete paving surfaces to be broom finish.
 - 2. Ramps: Minimum 0.8 static coefficient of friction is required for all concrete paving finish surfaces on ramps. All concrete paving surfaces on ramps to be broom finish.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed.
 - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
 - 1. Provide lumber ramping and plywood covering where curbs and gutters are subject to vehicular and equipment traffic during construction.

END OF SECTION

SECTION 32 17 13

PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- B. ASTM C150/C150M - Standard Specification for Portland Cement.
- C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, complying with the following:
 - 1. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
 - 2. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 - 3. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 - 4. Air Entrainment Admixture: ASTM C260/C260M.
 - 5. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
 - 6. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 7. Embed reinforcing steel, and drill or sleeve for two dowels.
 - 8. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 - 9. Minor patching in plant is acceptable, providing appearance of units is not impaired.
- B. Dowels: Cut reinforcing steel, 1/2 inch diameter, 1 inch long, pointed tip.
- C. Adhesive: Epoxy type.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.

END OF SECTION

SECTION 32 17 23.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Parking lot markings, including parking bays, crosswalks, accessibility symbols, and curb markings.
- B. "No Parking" curb painting.
- C. Exterior athletic court markings.
- D. Playground markings.

1.02 RELATED REQUIREMENTS

- A. Section 32 12 16 - Asphalt Paving.
- B. Section 32 1313 - Concrete Paving: Surface for painting.
- C. Section 32 17 26 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. CBC Ch. 11B - California Building Code-Chapter 11B.
- C. FED-STD-595C - Colors Used in Government Procurement (Fan Deck).
- D. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective.
- E. FS TT-P-1952 - Paint, Traffic and Airfield Marking, Waterborne.
- F. SAE AMS-STD-595 - Colors Used in Government Procurement.
- G. SSPWC (Greenbook) - Standard Specifications for Public Works Construction.
- H. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- I. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration.
- J. SCAQMD 1113 - Architectural Coatings.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

- D. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. See Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions regarding CalGreen requirements.
 - a. Comply at time of installation with Air Quality standards of:
 - 1) South Coast Air Quality Management District, SCAQMD 1113.
 - 2) California Air Resources Board (CARB).
 - 2. For accessibility markings see Part 3 Article "Installation".
 - 3. Conform to State of California, Department of Transportation (CALTRANS) Standard Specifications, Section 84, Traffic Control Markings, as amended and adopted by authorities having jurisdiction.
 - 4. Where reference is made to Standard Specifications, the following shall apply.
 - a. Perform off-site Work in public rights-of-way in accordance with requirements of authorities having jurisdiction. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction, including SSPWC (Greenbook).
 - b. Perform on-site Work as indicated and referenced on the Contract Drawings and as specified herein.
- B. Applicator Qualifications: Company regularly engaged in pavement marking, well-experienced in use of machine-applied painted stripes and other markings, with three years of verifiable experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.
- C. Store products in manufacturer's unopened packaging until ready for installation.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside paint manufacturer's absolute limits.
 - 1. Do not apply marking paint when weather is foggy or rainy, or when ambient or pavement temperatures are below 40 degrees F., or when such conditions are anticipated within eight hours of application.
- B. Do not apply marking paint when wind velocity causes uncontrollable overspray or excessively rapid drying.

- C. Sequence and Schedule: Apply pavement markings after asphaltic concrete and portland cement concrete and interlocking concrete paving Work are complete and properly cured and, if applicable, sealer has been applied to asphaltic concrete and landscaping Work is complete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Provide standard factory-mixed, quick drying and non-bleeding colors, conforming to Standard Specifications, as amended and adopted by the AHJ, City, and County, as applicable.
- B. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
 - 1. Parking Lots: Fast-dry type. If required by authorities having jurisdiction for Work in public rights-of-way, include reflective material in paint. Paint for marking curbs shall not require reflective material. See Color Schedule in Part 3.
 - 2. Accessibility Symbols: Blue shall conform to Color No. 15090, FED-STD-595C. (SAE AMS-STD-595)
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Recreational Area Paint:
 - 1. Paint: Water emulsion-based traffic paint; FS TT-P-1952.
 - 2. Color: To be selected by Architect from full range.
 - 3. Basis of Design Product: 6700 100%Acrylic Traffic Marking Paint as manufactured by Vista Paint, or approved equal.
 - 4. Products:
 - a. Behr: www.behr.com.
 - b. Dunn Edwards: www.dunnedwards.com.
 - c. Sherwin Williams; 2 Coats of SW Armorseal 8100 with Armorseal High Wear Additive in second coat: www.sherwin.com.
 - d. Vista Paint Corporation: www.vistapaint.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.
- E. Reflective Glass Beads at Accessible Parking Spaces: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.
 - 1. Comply with CBC Section 11B-502.6.4 Marking.
- F. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.
- G. Tactile Warning Surfaces: See Section 32 17 26.
- H. Raised Reflective Pavement Markers:

1. Specified Manufacturer: Pac-Tec, Inc., Heath, OH; local source Western Highway Products.
2. Ray-O-Lite Raised Reflective Pavement Markers:
 - a. Molded optic grade Methyl Methacrylate conforming to ASTM D4802 with fill material consisting of thermosetting compound designed for impact and wear resistance.
 - b. Optical Performance: Reflective intensity of reflecting surface at 1/5 degree divergence angle shall be not less than the following when the incident light is parallel.

<u>Horiz. Eng. Angle</u>	<u>Blue</u>
0 Degrees	3.0
20 Degrees	1.5

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
 2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
 1. Lay out markings as shown on Drawings. Use guide lines, templates and forms for precise edges and spacings.
 - a. At off-site and on-site public rights-of-way, obtain review and approval of layout by authorities having jurisdiction.

- F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to District.

3.03 INSTALLATION

- A. Regulatory Accessibility Requirements for Installation:
1. Pavement markings for disability requirements shall meet requirements of California Building Code (CBC), Title 24, Part 2, CBC Ch. 11B and ADA Standards, per latest amendments.
 - a. Accessible parking spaces serving a particular building or facility shall be located on the shortest accessible route to an entrance complying with CBC Ch. 11B-208.3.1.
 - b. Accessible parking spaces serving more than one accessible entrance shall be dispersed and located on the shortest accessible route to the accessible entrances.
 - c. Accessible parking spaces in a parking facility not serving a particular building or facility shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. CBC Ch. 11B-208.3.1
 - d. Minimum number of required accessible parking spaces shall be provided in accordance with CBC Ch. 11B Table 11B-208.2 for each parking facility provided on a site.
 - e. For every six or fraction of six accessible parking spaces, at least one shall be an accessible van parking space. CBC Ch. 11B-208.2.4
 - f. Accessible parking spaces and access aisles shall comply with CBC Ch. 11B-502 and shall be dimensioned to the centerline of the marked lines as follows:
 - 1) Parking spaces and access aisles shall be marked according to CBC Ch. 11B Figures 11B-502.2, 11B-502.3, and 11B-502.3.3.
 - (a) Their surfaces shall comply with CBC Ch. 11B-302 and shall be at the same level with slopes not steeper than 1:48 in any direction. CBC Ch. 11B-502.4.
 - 2) Parking spaces shall be 9 x 18 feet minimum and van parking spaces shall be 12 x 18 feet minimum with an adjacent access aisle of 5 x 18 feet minimum.
 - (a) Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces.
 - (b) Van parking spaces shall be permitted to be 9 x 18 feet minimum where the access aisle is 8 x 18 feet minimum.
 - 3) Access aisles shall be marked by a blue painted borderline around their perimeter.
 - (a) The area within the blue borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface, preferably blue or white.

- (b) Access aisle markings may extend beyond the minimum required length. CBC Ch. 11B-502.3.3
 - (c) At drive aisle provide minimum 12 inch high white letters with the text "NO PARKING" per CBC Ch. 11B Figure 11B-502.3.3.
 - 4) Access aisles (parking spaces as well- similar application) shall not overlap the vehicular way. CBC Ch. 11B-502.3.4
 - 5) A vertical clearance of 98 inches minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. CBC Ch. 11B-502.5
- 2. At least one passenger loading zone shall be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with CBC Ch. 11B-209 and 11B-503 as follows:
 - a. Vehicle pull-up spaces shall be 8 x 20 feet minimum.
 - 1) Access aisles shall be 5 feet wide minimum x full length of vehicle pull-up spaces they serve and shall be adjacent and parallel to the vehicular pull-up spaces.
 - 2) They shall be at the same level with slopes not steeper than 1:48 in any direction.
 - 3) Access aisle shall adjoin an accessible route and shall not overlap the vehicular way.
 - b. Access aisles for passenger drop-off and loading zone shall be marked with a painted borderline around their perimeter.
 - 1) The area within the borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface. CBC Ch. 11B-503.3.3.
 - (a) Blue perimeter lines with blue interior hatch lines are preferred for concrete surfaces and blue perimeter lines with white interior hatch lines are preferred for asphalt surfaces.
 - (b) Where white hatch lines are used, hatch lines shall be interrupted at 12 inch high "No Parking" text so that legibility is maintained.
 - c. A vertical clearance of 114 inches minimum shall be provided for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. CBC Ch. 11B-503.5.
- 3. Bus loading zones and bus stops shall comply with CBC Ch. 11B-209 and 11B-810.2 as follows:
 - a. Boarding and alighting areas shall be of 8 x 5 feet minimum, with 8 feet measured perpendicular to the curb or vehicle roadway edge, and with 5 feet measured parallel to the vehicle roadway.
 - 1) Slopes in 8 foot direction shall be 1:48 maximum.
 - 2) Slopes in 5 foot direction shall be the same as that of the roadway, to the maximum extent practicable. CBC Ch. 11B Figure 11B-810.2.2.
 - b. Bus shelters shall provide a minimum 30 x 48 inches clear floor or ground space (36 x 48 inches or 36 x 60 inches in an alcove per CBC Ch. 11B-305.7), with slopes not steeper than 1:48 in any direction, entirely within the shelter complying with CBC Ch. 11B-305.

- c. Bus shelters shall be connected by an accessible route complying with CBC Ch. 11B-402 to a boarding and alighting area complying with CBC Ch. 11B-810.2 and Figure 11B-810.3.
 - d. Newly constructed bus stop boarding and alighting areas shall provide a detectable transition between the boarding/alighting area and the roadway; the detectable transition shall consist of a curb with the face sloped at 35 degrees maximum from vertical or detectable warnings complying with CBC Ch. 11B-705.1.1 and 11B-705.1.2.4.
4. Electric Vehicle Charging Stations:
- a. Where Electric Vehicle Charging Stations are provided, they shall be provided in accordance with CBC Ch. 11B-228.3, Table 11B-228.3.2.1 and CBC Ch. 11B- 812 (see 11 11 36 - Vehicle Charging Equipment for additional requirements).
 - b. Accessibility requirements for Public Use or Common Use EVCS facilities:
 - 1) Vehicle spaces and access aisles serving them shall comply with CBC Ch. 11B-302. Access aisles shall be at the same level as the vehicle space they serve. Changes in level, slopes exceeding 1:48, and detectable warnings shall not be permitted in vehicle spaces and access aisles. CBC Ch. 11B-812.3
 - 2) Vehicle spaces, access aisles serving them and vehicular routes serving them shall provide a vertical clearance of 98 inches minimum. CBC Ch. 11B-812.4
 - 3) Accessible routes between EVCS parking, equipment and the building or facility served shall be provided per CBC Ch. 11B-812.5
 - 4) Vehicle spaces for van accessible, standard accessible, ambulatory and drive-up EVCS shall meet minimum length and width requirements per CBC Ch. 11B-812.6.
 - 5) Accessible EVCS stalls shall be marked "EV Charging Only" per CBC Ch. 11B-812.9 and Figure 11B-812.9.
 - 6) Access aisles for van accessible and standard accessible EVCS shall meet minimum length and width requirements and be marked per CBC Ch. 11B-812.7 the color of the perimeter, hatch lines and "No Parking" letters shall contrast with the surface color (blue color required for use at non-EVCS accessible parking shall not be used).
 - 7) ISA Signs:
 - (a) Where four or fewer total EVCS are provided, identification with an International Symbol of Accessibility (ISA) shall not be required.
 - (b) Where five to twenty-five total EVCS are provided, one van-accessible EVCS shall be identified with an ISA complying with CBC Ch. 11B-703.7.2.1. The required standard accessible EVCS shall not be required to be marked with an ISA.
 - (c) Where twenty-six or more EVCS are provided, all required van-accessible and all required standard accessible EVCS shall be identified with an ISA.
 - (d) The required ISA identification sign shall be reflective with a minimum 70 square inches, shall be visible from the EVCS it serves. The sign shall be permanently posted either immediately adjacent to the vehicle space or within the projected vehicle space at the head end of the vehicle space. Signs identifying van accessible vehicle spaces shall contain the designation "Van Accessible". Signs shall be minimum 60 inches above the

finish surface except that if the sign projects into a pedestrian circulation area, they shall be minimum 80 inches above finish surface CBC Ch.

11B-812.8

- 8) Ambulatory EVCS complying with CBC Ch. 11B-812.6.3 shall be required where 26 or more EVCS are provided. CBC Ch. 11B Table 11B-228.3.2.1

- B. General: Using proper masking, stencils and application equipment, apply marking paint at rate recommended by paint manufacturer or approximately one gallon per 150 square feet (equivalent to approximately one gallon for 450 lineal feet of 4-inch wide stripe), whichever is greater.
1. Equipment shall be capable of operating at 125 psi air pressure, agitate paint constantly and hold exactly to the alignment.
 2. Equipment used for applying reflectorized striping shall be equipped with a bead dispenser capable of applying beads at the specified rate.
- C. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- D. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
- E. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- F. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- G. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- H. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
1. Apply paint in one coat only.
 2. Wet Film Thickness: 0.015 inch, minimum.
 3. Length Tolerance: Plus or minus 3 inches.
 4. Width Tolerance: Plus or minus 1/8 inch.
- I. Curbs: Paint full vertical face and first 6-inches of horizontal plane at top of curb or combination curb/paving. Provide minimum 2 coats paint.
1. Provide stenciled text in the height, spacing and typeface as indicated on Drawings.
- J. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
1. Mark the International Symbol of Accessibility at indicated parking spaces.
 - a. Accessibility Logo: Provide minimum of 2 coats paint.
 - 1) Comply with CBC Figure 11B-703.7.2.1.
 - b. Stall Marking:
 - 1) Use single-line style striping between parking stalls, unless otherwise indicated.
 - 2) Comply with local agency regulatory requirements.
 - 3) Accessible Stalls: Comply with ADA Standards and local agency regulatory requirements.
 - (a) Painted lines and markings on pavement shall be minimum 3 inches wide, color as indicated on Drawings

- (b) Tactile warning lines shall comply with CBC Section 11B-705.1.2.5 Hazardous Vehicular Areas.
 - (c) Tactile warning devices shall comply with CBC, see Section 32 17 26 - Tactile Warning Surfacing.
- c. Hatching: Provide hatching in parking areas, including accessible parking stalls, as indicated on Contract Drawings or as required by Standard Details. Should Contract Drawings and Standard Details conflict, comply with the more stringent.
- 2. Hand application by pneumatic spray is acceptable.
- K. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.
- L. Speed Bumps: Provide minimum 2 coats paint on raised portion.
- M. Recreational Areas: Provide minimum 2 coats paint.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
 - 1. Prevent construction activities over completed markings, except light vehicular and pedestrian traffic.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Touch-up paint as required to provide clean, straight lines and full coverage of surfaces.
- E. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- F. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- G. Replace removed markings at no additional cost to District.
 - 1. Clean up all oil, paint splatters and other stains from surfaces in preparation for Substantial Completion review.

3.05 COLOR SCHEDULE

- A. Parking and On-Site Roadways

<u>Location</u>	<u>Color</u>	<u>Reflectance**</u>
Driving lane striping	White	82%
Parking space striping	White	82%
Accessible Parking, ISA, and zone markings	Blue No. 15090 per FED-STD-595C (SAE AMS-STD-595)	52%

Accessible loading and cross-hatching	A. White with Blue perimeter at Asphalt Paving. B. Blue at Concrete Paving*	82% / 52% 52%
12 inch high Text: "NO PARKING", "LOADING ZONE", and "FIRE LANE", etc.	White	82%
Firelanes / No Parking zone markings Special Use Markings	Red No. 31350 per FED-STD-595C (SAE AMS-STD-595)	52%
Loading zone markings	Orange Yellow No. 33538 per FED-STD-595C (SAE AMS-STD-595)	52%
Directional arrows	White	82%
Speed Bumps	Orange Yellow No. 33538 per FED-STD-595C (SAE AMS-STD-595)	52%
Black special-use pavement markings, if indicated on Drawings	Black No. 37038 per FED-STD-595C (SAE AMS-STD-595)	NA

*Contrasting color per CBC.

a. See also Division of the State Architect IR 11B-7.

**Daylight directional reflectance (without glass beads) , when tested in accordance with Federal Test Method Standard 141A, Method 612.

B. Electrical Vehicle Charging Station (EVCS):

<u>Location</u>	<u>Color</u>	<u>Reflectance*</u>
EVCS Parking space striping	Yellow No. 33655 per FED-STD-595C (SAE AMS-STD-595)	52%
12 inch high Text: "EV CHARGING ONLY" CBC 11B-812.9	Yellow No. 33655 per FED-STD-595C (SAE AMS-STD-595)	52%
EVCS Accessible Parking, ISA, and zone markings. CBC Table 11B-228.3.2.1 1-4 EVCS Spaces: Provide space sized for van accessible use. Signage not required. CBC 11B-812.8.1 5-25 EVCS spaces: Provide one van and one standard accessible signage and ISA. >25 EVCS Spaces: Provide at each required accessible space.	Yellow No. 33655 per FED-STD-595C (SAE AMS-STD-595)	52%
Accessible loading and cross-hatching. 12 inch high Text: "EV CHARGING ONLY" CBC 11B-812.8 "NO PARKING" CBC Figure 11B-812.9	Yellow No. 33655 per FED-STD-595C (SAE AMS-STD-595) Do not use blue.	52%

*Daylight directional reflectance (without glass beads) , when tested in accordance with Federal Test Method Standard 141A, Method 612.

C. Athletic Courts and Recreational Areas

<u>Location</u>	<u>Color</u>
Athletic Court Lines on asphalt	White*
Athletic Court Lines on concrete	Yellow*

*Exterior Recreational Use: Marking Width and Color; Unless indicated otherwise on Drawings.

- a. Athletic Court Lines: 2 inches White
- b. Where two sets of lines overlap, one set provide one in white and the other set yellow or as indicated on Drawings.

END OF SECTION

SECTION 32 17 26
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for sidewalks and platforms.
- B. Section 32 13 13 - Site Concrete: Concrete sidewalks.
- C. Section 32 17 23.13 - Painted Pavement Markings: Crosswalk and curb markings.

1.03 REFERENCE STANDARDS

- A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA).
- B. AASHTO LRFD - Bridge Design Specifications.
- C. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- D. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- G. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
- H. ASTM C903 - Standard Practice for Preparing Refractory Specimens by Cold Gunning.
- I. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
- J. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
- K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- L. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- M. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- O. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- P. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way.
- Q. SAE AMS-STD-595 - Colors Used in Government Procurement.
- R. California Department of General Services, Division of the State Architect, Interpretation of Regulations Document:

1. IR A-5 - Acceptance of Products, Materials and Evaluation Reports; Revised 1/27/17.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.
- C. Samples: For each product specified provide two samples, 8 inches square, minimum; show actual product, color, and patterns.
- D. Shop Drawings: Submit plan and detail drawings. Indicate:
 1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
 2. Sizes and layout.
 3. Pattern spacing and orientation.
 4. Attachment and fastener details, if applicable
- E. Warranty: Submit manufacturer warranty; complete forms in District's name and register with manufacturer.
- F. Certification: Manufacturers certification that product meets ADA for tactile warning surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.
- B. Installer Qualifications: Company certified in writing by product manufacturer as having successfully completed work substantially similar to the work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.
- B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.
 1. Provide minimum 5 year warranty per DSA Bulletin 10/31/02, revised 04/09/08.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Detectable warnings shall comply with California Building Code (CBC) Section 11B-705.1 requirements, Section 11B-705.1.2 Locations and 11B-705.1.2.5 Hazardous Vehicular Areas, for special warnings for disabled persons.
- B. Nominal dimensions meeting Section 11B-705.1.2 Locations.
- C. Color contrast requirements meeting Section 11B-705.1.1.3 Contrast.
- D. Detectable warning surfaces at transit boarding platform edges, bus tops, hazardous vehicle areas, reflecting pools, and track crossings shall be yellow and approximate Federal Color No. 33538 as shown in SAE AMS-STD-595 (Table IV of Federal Standard No. 595C).
 - 1. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces.
 - 2. The materials used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.
- E. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. CBC Section 11B-705.1.1.4 Resiliency.
- F. Color yellow for detectable warning surface is required at all hazardous vehicle locations and shall conform to Federal Color No. 33538 as shown in Table IV of Federal Standard No. 595C. CBC Sections 11B-705.1.1.3 Color and Contrast.
 - 1. Except for locations at curb ramps, islands, or cut-through medians where color used shall contrast visually with that of adjacent walking surfaces, either light-on-dark, or dark on-light. CBC Sections 11B-705.1.1.3 Contrast and 11B-705.1.1.5 Color.
- G. Truncated dome pattern in-line, not staggered.

2.02 MANUFACTURERS

- A. Plastic Tactile and Detectable Warning Surface Tiles:
 - 1. Access Tile, a brand of Access Products, Inc: www.accesstile.com.
 - 2. ADA Solutions, Inc: www.adatale.com/#sle.
 - 3. Answer Industries: www.answerindustries.com.
 - 4. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com/#sle.
 - 5. Safety StepTD, Inc.; SSTTD-Traditional Mat System: www.safetystepTD.com
 - 6. Transpo Industries, Inc.: www.transpo.com
 - 7. Van-Duerr Industries, Inc.: safepathproducts.com.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 TACTILE AND DETECTABLE WARNING TILES

- A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern,

solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory-applied removable protective sheeting.

1. Material Properties:
 - a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
 - b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
 - c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
 - d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
 - e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
 - f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
 - g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
 - h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
 - i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
 - j. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.
 - k. Loading: No damage when tested according to AASHTO LRFD test method HS20.
 - l. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.
2. Installation Method: Surface applied.
3. Shape: Rectangular.
4. Dimensions: 24 inches by 36 inches.
 - a. Curb Ramp: Cover entire width of the ramp surface, minimum 36 inches along path of travel.
 - b. Drive Aisle: 36 inches along path of travel.
5. Dome Spacing: 2.3 to 2.4 inches per CBC Section 11B-705.1.1.2.
6. Pattern: In-line pattern of truncated domes complying with ADA Standards.
7. Edge: ADAAG compliant bevel.
8. Joint: Butt.
9. Color: SAE AMS-STD-595, Table IV, Federal Yellow No. 33538.
10. Basis of Design Product: SSTD Traditional Mat System as manufactured by Safety Step TD; www.safetysteptd.com, or approved equal.

2.04 ACCESSORIES

- A. Fasteners: ASTM A666, Type 304 stainless steel
 1. Type: Countersunk, color matched composite sleeve anchors

- 2. Size: 1/4 inch diameter and 1-1/2 inches long.
- B. Adhesive: Type recommended and approved by surfacing tile manufacturer.
- C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. When installation location is near site boundary or property line, verify required location using property survey.
- B. Verify that work area is ready to receive work:
 - 1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
 - 2. Do not proceed with installation until deficiencies in existing conditions have been corrected.
- C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's written instructions.
 - 1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
 - 2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.
- B. Field Adjustment:
 - 1. Cut units to size and configuration shown on drawings.
 - 2. Do not cut tiles to less than 9 inches wide in any direction.
 - 3. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
 - 4. Orient so dome pattern is aligned with the direction of ramp.
 - 5. Align truncated dome pattern between adjacent units.
- C. Install units fully seated to substrate, square to straight edges and flat to required slope.
- D. Align units so that tops of adjacent units are flush and joints between units are uniform in width.

3.03 INSTALLATION, PRECAST TILES

- A. Concrete Substrate:
 - 1. See Section 32 13 13 - Concrete Paving.
 - 2. Slump: 4 to 7 percent.
- B. When installing multiple adjacent units, leave a 3/16 inch gap between units to allow for expansion.
- C. Tamp and vibrate units as recommended by manufacturer.

- D. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

3.04 INSTALLATION, CAST IN PLACE PLASTIC TILES

- A. Concrete:
 - 1. See Section 32 13 13 - Concrete Paving.
 - 2. Slump: 4 to 7 percent.
- B. When installing multiple adjacent units, leave a 3/16 inch gap between units to allow for expansion.
- C. Tamp and vibrate units as recommended by manufacturer.
- D. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

3.05 INSTALLATION, SURFACE APPLIED PLASTIC TILES

- A. Cure concrete surfaces for a minimum of 4 days before installing units.
- B. Verify substrate is clean and dry; free of voids, projections and loose material. Remove dust, oil, grease, curing compounds, sealers and other substances that may interfere with adhesive bond or sealant adhesion.
- C. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.
- D. When installing multiple adjacent units, leave a 1/8 inch gap between tiles to allow for expansion.
- E. Drill fastener holes straight, true and to depth recommended by manufacturer.
- F. Apply adhesive to back of unit as recommended by manufacturer.
- G. Mechanically fasten to substrate. Avoid striking or damaging the unit itself during installation.
- H. Apply sealant to edges in cove profile.

3.06 PROTECTION

- A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.
- B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decorative steel fences.
- B. Excavation for post bases; concrete foundation for posts and center drop for gates.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Custom fabricated metal components.
- B. Section 32 13 13 - Site Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- E. ASTM D523 - Standard Test Method for Specular Gloss.
- F. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints.
- G. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- H. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- I. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- J. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) .
- K. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test.
- L. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings:
 - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- D. Installer's Qualification Statement.
- E. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.
- F. Field Inspection Records: Provide installation inspection records that include post settings, framework, fittings and accessories, gates, and workmanship.
- G. Manufacturer's Warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.
- C. Fabricator's Qualifications: Fabricator of light structural steel framing members and other miscellaneous metal fabrications of structural character shall have a minimum 5 years experience fabricating similar fences and gates and shall be approved by the Building Official in accordance with applicable Code provisions.
- D. Welder's Qualifications: Welding shall be performed by certified welders qualified in accordance with procedures specified in applicable referenced AWS standard, using materials, procedures and equipment of the type required for the Work. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
- E. Coordination: Provide templates and sleeves for incorporation of embedded items into the work specified elsewhere herein or in other Sections.
- F. Field-Verified Dimensions: Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Architect.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.
- B. Delivery, Storage and Handling of Galvanized Products:
 - 1. Stack and bundle during transport and store to allow air flow between galvanized surfaces.
 - 2. Load for transport to permit continuous drainage should wetting occur.
 - 3. Do not rest galvanized products on cinders or clinkers.

4. Material showing evidence of damage shall be rejected.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide ten year warranty for finish.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS:

- A. Provide fences and gates meeting life safety and accessibility requirements of California Building Code (CBC) Title 24, Part 2, Chapters 10 and 11B; and ADA Standards, per latest amendments.
 1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404 and 11B-206.5.
 2. Gate Hardware: Meet the requirements of CBC 11B-206.5 and 11B-404.2.9.
 - a. Latch: Latch, including padlock eye as integral part of latch, mounted 40 inches above finish grade. Comply with California Fire Code.
 - b. Hardware shall comply with local Fire Authority, California Building Code (CBC) Title 24, Section 1010.2, and California Fire Code (CFC) Section 503.5.2.
 - c. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2 inch of the (face of) gate to prevent catching on the clothing or persons. California Referenced Standards Code T-24 Part 12, Section 12-10-202, Item (F).
 - d. Hand activated opening hardware, handles, pulls, latches, locks, and other operating devices for and accessible gate shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. CBC Section 11B-404.2.7 and 11B-309.4.
 3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10
 4. The bottom of the gate shall be within 3 inches of the finish surface of the path of travel. The maximum effort to operate a gate shall not exceed 5 lbf. CBC Section 11B-404.2.9.

2.02 FENCES

- A. Fences: Complete shop-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with specified coating, and having the following performance characteristics:
 1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

- B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
 - 1. Total Coating Thickness: 2 mils, minimum.
 - 2. Coating Performance: Comply with general requirements of ASTM F2408.
 - a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
 - b. Corrosion Resistance: ASTM B117, ASTM D714 and ASTM D1654; 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.
 - c. Impact Resistance: ASTM D2794; 60 inch pounds.
 - d. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.
- C. Steel: ASTM A653/A653M; tensile strength 45,000 psi, minimum.
 - 1. Hot-dip galvanized; ASTM A653/A653M, G60.
 - 2. 62 percent recycled steel, minimum.
- D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
 - 1. Self-drilling hex-head screws.

2.03 WELDED STEEL FENCE

- A. Basis of Design Product: Montage II® - Heavy Industrial Steel Ornamental Fence System – Fusion Welded and Rackable with 3-Rail Majestic Pickets as manufactured by Ameristar Perimeter Security, USA, or equal.
- B. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.
- C. Fence Panels: Fusion welded; 8 feet high by 10 feet long.
 - 1. Panel Style: As indicated on Drawings.
 - 2. Attach panels to posts by welding.
- D. Posts: Steel tube.
 - 1. Size: 3 inches square by 12 gage, 0.109 inch, with manufacturer's standard cap.
 - 2. Post Cap: Peaked plate, watertight.
- E. Rails: Manufacturer's standard, double-wall steel channel 1-3/4 inch square by 12 gage, 0.1094 inch with prepunched picket holes.
 - 1. Picket Retaining Rods: 0.125 inch galvanized steel.
 - 2. Picket-to-Rail Intersection Seals: PVC grommets.
- F. Pickets: Steel tube.
 - 1. Spacing: 3-3/4 inch clear.
 - 2. Size: 1 inch square by 14 gage, 0.0785 inch.
 - 3. Style: Pickets with finial extend above top rail.
 - 4. Finial: Pointed picket finial.
- G. Flexibility: Capable of following variable slope of up to 1:2.

- H. Color: Black.
- I. Hinged Gates:
 - 1. Steel Gate: Fabricated steel gate as indicated on Drawings. See Section 05 50 00 - Metal Fabrications.
 - 2. Construction: Match adjacent fence
 - a. Pedestrian Swing Gates: Self-closing; gate leaf no larger than 48 inches width.
 - b. Provide cable kits for additional trussing for all gates leaves over 6 ft..
 - c. Infill Panel:
 - 1) Perforated Panels: ASTM A653/A653M G90 Galvanized steel panel, staggered perforated pattern. Paint to match fence.
 - (a) 18 gage, 1/4 inch holes and 3/8 inch spacing, or equal.

2.04 SPECIALITY HARDWARE

- A. Pedestrian Gate Hardware: Provide non-lift-off type and 180 degree opening hinges, latches, drop bolts, and other hardware required.
 - 1. See Section 08 71 00 - Door Hardware for specific items.
 - 2. Hardware to comply with local Fire Authority, California Building Code (CBC) Title 24 section 1013; and California Fire Code (CFC) section 503.5.2.
 - a. Hardware to be operable with single effort lever-type hardware, or other hardware designed to provide passage without grasping or twisting.
 - 3. Double and Single Leaf Gates: Provide with mechanisms for padlocking gates in open position.
 - 4. Gates across an exit to a public way or to a safe dispersal area shall have panic hardware. No padlocks or cane bolts are be allowed.
- B. Gate Hardware, Not on on Path of Travel:
 - 1. Hinges:
 - a. Size and type as determined by manufacturer.
 - b. Provide 2 hinges for each leaf up to 6 feet high and 1 additional hinge for each additional 24 inches in height or fraction thereof.
 - 2. Latch: 3/4 inch diameter slide bolt to accommodate padlock.
 - 3. For double gates provide padlockable, 5/8 inch diameter center cane bolt assembly and strike.
- C. Hinges: Finished to match fence components.
 - 1. Closing: Self.
 - 2. Mechanism: Hydraulic.
 - 3. Material: Steel.
 - 4. Mounting: External.
 - 5. Brackets: Round.
 - 6. Bearings: Plain.
 - 7. Products:

- a. Loconix; Mammoth: www.loconix.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Latches: Finished to match fence components.
 - 1. Mechanism: Gravity.
 - 2. Locking: Mechanical.
 - 3. Material: Steel.

2.05 FABRICATION

- A. Metal Fences, Gates and Components: Fabricated of galvanized steel construction, all welded with welds ground smooth. Provide steel anchors for securing into adjoining construction. Weld anchors to frames not more than 12 inches from both top and bottom and space anchors not more than 24 inches apart.
- B. Swinging Gates: Fabricate gates of galvanized steel framework with infill panels as specified herein. Provide with latch of type to permit operation from either side of gate by means of lever handles, and incorporating a padlock eye as integral part of latch. Latch shall be mounted 40 inches above finish grade. Comply with California Fire Code (CFC) Article 1208.
 - 1. On gates over 5 feet; Install diagonal cross bracing consisting of 3/8 inch diameter truss rods with drop forged steel turnbuckles where necessary to insure frame rigidity without sag or twist.

2.06 ACCESSORIES

- A. Concrete: Ready-mixed, complying with ASTM C 94/C 94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.
- D. Coordination: Coordinate fence and gate Work with Work specified in other Sections so that related Work shall be accurately and properly joined. Furnish templates for exact location of items to be embedded in concrete or masonry.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Obtain Architect's review prior to site cutting or making adjustments not indicated on Drawings and reviewed shop drawings.
- C. Clean and strip site primed steel items to bare metal where site welding is necessary.
- D. Make provision for erection loads with temporary bracing. Keep work in alignment.

- E. Provide items required to be cast into concrete with setting templates. Coordinate placement with adjacent Work.
- F. Clean and prime field welds. Touch up galvanized steel with cold repair compound.

3.03 INSTALLATION

- A. Installation, General: Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Install in accordance with fabricator's instructions.
- C. Set fence posts in accordance with the approved spacing.
- D. Perform field welding in accordance with AWS D1.1/D1.1M. All welds ground smooth.
- E. When cutting rails immediately seal the exposed surfaces by:
 - 1. Removing metal shavings from cut area.
 - 2. Apply zinc-rich primer or galvanizing patch compound to thoroughly cover cut edge and drilled hole; allow to dry.
 - 3. Apply two coats of custom finish spray paint matching fence color.
- F. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
 - 1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
 - 2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
 - 3. Provide gate hardware as specified for the gate and install per manufacturer's recommendations
- G. Provide concrete center drop to footing depth and drop rod retainers at inactive leaf, at center of double gate openings.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From Indicated Position: 1 inch.
- C. Minimum Distance from Property Line: 6 inches.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Post Settings: Randomly inspect three locations against design for:
 - 1. Hole diameter.
 - 2. Hole depth.
 - 3. Hole spacing.
- D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

- E. Gates: Inspect for level, plumb, and alignment.
- F. Workmanship: Verify neat installation free of defects.

3.06 CLEANING

- A. Leave immediate work area neat at end of work day.
- B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- C. Clean fence with mild household detergent and clean water rinse well.
- D. Touch up scratched surfaces using visually materials recommended by manufacturer. Match touchup paint color to fence finish.
 - 1. Galvanized Touch-Up: Touch up surfaces immediately after installation, including field welding. Prepare surface and apply cold repair compound in compliance with the product manufacturer's instructions and recommendations.
 - a. Material: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction. Provide finish coat to match galvanized finish.
- E. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

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

END OF SECTION

SECTION 32 84 23

IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section covers the furnishings of all materials and performing all operations to provide a complete operable Landscape Irrigation System as directed on the drawings including the following:
 - 1. Trenching, stockpiling excavated material and refilling trenches.
 - 2. Irrigation System components including but not limited to: piping, valves, fittings, bubblers, wiring and final adjustments as determined by the District Representative to insure efficient and uniform distribution.
 - 3. Testing and inspection of Irrigation System.
 - 4. Clean up and maintenance.
- B. Related Sections include the following:
 - 2. Division 32 Section "Planting" for landscaping.

1.02 DEFINITIONS

- A. Lateral Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Pressure Piping: Downstream from point of connection to water distribution piping to and including control valves. Piping is under water distribution system pressure.
- C. The following are industry abbreviations for plastic materials.
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic
 - 2. NP: Nylon plastic
 - 3. PE: Polyethylene plastic
 - 4. PP: Polypropylene plastic
 - 5. PTEF: Polytetrafluoroethylene plastic
 - 6. PVC: Polyvinyl chloride plastic

1.03 GENERAL REQUIREMENTS

- A. Code Requirements shall be those of State and Municipal Codes and Regulations locally governing this work, providing that any requirements of the Drawings and Specifications, not conflicting therewith but exceeding the Code Requirements shall govern, unless written permission to the contrary is granted by the Architect.

- B. Conform to the requirements of the reference information listed below except where more stringent requirements are shown or specified in the most current set of construction documents:
 - 1. American Society for Testing Material (ASTM), for test methods specifically referenced in this section.
 - 2. Underwriter's Laboratories (UL), for UL wires and cables.
 - 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
 - 4. Comply with ASTM F645, "Guide for Selection, Design, and Installation of Thermoplastic Water- Pressure Piping Systems."
 - 5. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.
 - 6. Furnish plastic pipe and fittings permanently marked with size, class, and type of pipe, working pressure at 73.4 degrees F, and National Sanitation Foundation (NSF) rating.
- C. A licensed and bonded plumbing contractor shall execute work involving substantial plumbing for installation of copper piping, backflow prevention devices and other related work. Obtain any necessary permits prior to beginning work.
- D. Specified depths of pressure supply lines, laterals and pitch of pipes as stated in this section are minimums. Settlement of trenches lower than grades specified on the final grading plans is cause for removal of finish grade treatment, refilling trenches, re-compacting and repairing of finish grade treatment.
- E. Follow current printed manufacturer's specifications and drawings for items or information not specified or graphically indicated in the most current set of construction drawings.
- F. Dimensions indicated are approximate. It is not possible to indicate all required offsets, fittings and other related equipment graphically on the construction drawings. Contractor shall be responsible for minor changes caused by actual site conditions. Before proceeding with any work, Contractor shall carefully check and verify all dimensions of related architectural elements, utilities and landscaping; and furnish and install required fittings.
- G. Do not install the irrigation system as shown on the Drawings when it is obvious that actual field conditions such as physical obstructions, grading discrepancies and field dimensions vary from those recorded on the construction drawings. Immediately bring any such discrepancies to the attention of the District Representative prior to proceeding with work. If immediate notification is not given and such discrepancies exist, Contractor shall assume full responsibility for necessary revisions, as determined by the District Representative.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Exercise caution in handling, loading and storing of plastic pipe and fittings to avoid damage.
- B. Transport pipe in a vehicle with a bed long enough to allow the length of pipe to lay flat so as not to be subjected to undue bending or concentrated external load at any point. Support pipe during storage from sagging and bending. Store plastic piping protected from direct sunlight.

- C. Discard pipe that has been dented or damaged unless such dent or damaged section is cut and rejoined with a coupling.
- D. Protect valves, fittings, and specialties from moisture, dirt, and other possible contaminants.

1.05 SEQUENCING AND SCHEDULING

- A. Install landscape headers, sidewalks, and mowing strips before installation of sprinkler system. Sleeves and mainlines under paving shall be in place before paving construction.
- B. Specimen trees (24 inches box and larger) shall be installed before the location of the irrigation system.
- C. Coordinate lawn sprinkler piping with utility work.
- D. Obtain permission, in writing, from the District at least 2 working days before shutting off existing in-use water lines. Contractor shall receive instructions from the District as to the exact length of time of each shut-off. Notify the District Landscape Inspector of said intent.

1.06 EXISTING FIELD CONDITIONS

- A. Preserve and protect all existing trees, plants, monuments, structures, hardscape and architectural elements from damage due to work in this section. In the event that damage does occur to inanimate object and structures, Contractor shall repair or replace such damage to the satisfaction of the District Representative. Contractor at Contractor's expense shall replace damaged or injured living plant material.
- B. Trenches adjacent to or under existing trees shall be closed within 24 hours. When this is not possible, the side of trench closest to the tree or trees affected shall be covered with moistened burlap.
- C. Protect, maintain and coordinate work with other contracts, specifications, trades, and utilities. Exercise extreme care in excavating and working in areas where utilities exist. Contractor shall be responsible for damages caused by its operations. In the event that damage does occur, Contractor shall pay the costs of such repairs.
- D. Use caution where trenches and piping cross existing roadways, sidewalks, hardscape, paths or curbs. Contractor shall be responsible for damages caused by its operations.

1.07 REQUIRED DOCUMENTS

- A. Service Manuals
 - 1. Submit, prior to beginning construction, a list of irrigation equipment to be used, accompanied by manufacturer's catalog data, specifications, or other literature clearly indicating compliance with specification requirements for each item.
 - 2. Furnish (4) four service manuals to the District prior to scheduling a walk through for Substantial Completion. Submit manuals in bound form complete with a table of contents, copy of contractor's warranty, and workmanship form on company letterhead. Manuals shall contain complete large-scale drawings of all installed equipment showing component warranties and catalog numbers together with the manufacturer's name and address. Manuals shall include operation instructions.

Manuals shall be subject to approval by the District or District Representative as to completeness.

B. Record Drawings

1. Prior to beginning work in the field, secure a complete set of irrigation plans, details, and specifications on reproducible drawings at the original scale. Contractor shall be responsible for making a set of black line prints for every week on the project. At the end of each working day, Contractor shall record all work accomplished for that day on the set of black line prints in red ink. These record drawings shall be brought up to date at the end of each workweek by a qualified draftsman. The drawings should indicate the following:
 - a. Any zoning changes.
 - b. Dimension from two permanent points of reference (building corners, fixed hardscape corners, road intersections, permanent existing utilities) the location of the following items:
 - 1) Connection to existing water lines
 - 2) Routing of pressure supply lines at every 100 feet along routing.
 - 3) Electric control valves
 - 4) Control wire routing (if routed separately from pressure supply line)
 - 5) Other equipment as directed by the District.
3. Prior to scheduling a walk through for Substantial Completion, provide a record set of field drawings as described above to the District for review. After review, the District will return the set to the field foreman requesting further information or will notify that the record set of field drawings are complete. After approval from the owner, a walk through for Substantial Completion may be scheduled.
4. Prior to scheduling the final walk through, the final set of irrigation record drawings shall be professionally drafted.
5. Contractor is responsible for delivering the final set of record drawings to the District or District Representative prior to initiating the maintenance period.

C. Controller Charts

1. Provide drawings for each controller unit installed on the project. The controller drawings shall be an actual blue print reduction of the new area covered by that controller unit and shall be at the maximum allowable scale that will fit inside the controller door without folding the drawing. The chart shall be a plot plan, entire or partial, showing building(s), walks, roads and walls. Drawings shall show valves and sprinkler heads serviced by that particular controller identifying each station by separate color. Number valves shall match the operation schedule and the drawings. All zones controlled by a controller shall be included on a single sheet. Only those areas controlled by that controller shall be shown. District's Landscape Inspector shall review this print prior to submittal. It shall be hermetically sealed by plastic, and then be secured to the inside door of the controller enclosure.

2. Prepare and submit additional copies of color coded controller drawings as follows:
two –11 inches x 17 inches laminated copies, one - 8 inches x 11 inches laminated copy,
and one - 11 inches x 17 inches non-laminated copy.
3. Submit controller charts to the District representative prior to requesting a walk-thru
for substantial completion.

1.08 WARRANTY

- A. Contractor shall warrant materials against defects and guarantee workmanship for the
period of one year. Contractor shall be responsible for coordinating warranty items with
manufacturer /distributor and the District.
- B. Settlement of trenches, which may occur during the one-year warranty period, shall be
repaired by Contractor at no expense to the District.

1.09 EXTRA STOCK AND EQUIPMENT CERTIFICATIONS

- A. Prior to a release of responsibility, schedule a walk through with the District Representative
and disclose and provide the following:
 1. Five (5) bubblers with nozzles and screens of each type used, for every 100 bubbler
heads installed on the project.
 2. Two (2) sets of the required equipment specific specialty tools for removing,
disassembling and adjusting each type of sprinkler head, isolation valve, and electric
control valve used on the project.
 3. All manufacturers' rebate certificates.
 4. One (1) nickel-chrome plated 16-gauge steel 36 inches tube sampler soil probe, as
manufactured by Oakfield or approved equal.
 5. All manufacturers' warranty information stating length of warranty and how to
exercise warranty on all valves, irrigation controllers and sprinkler heads.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The design of the irrigation system is based on the manufacturers and products specified
herein or indicated on the Drawings. Substitutions will be permitted only with the Architect
or District Landscape Inspector's approval. Where such substitution will change the
coverage or flow rates of the sprinkler heads, the request for substitution shall include
layout plans showing revised sprinkler head locations. Such revised layout plans shall
provide coverages and watering rates equivalent to those indicated. The District's
Landscape Inspector shall be notified of any design changes or substitutions.

2.02 PIPING – SCHEDULE 1

- A. General Piping:
 1. Pipe sizes shown are nominal inside diameter unless otherwise noted.
 2. Pipe shall be identified with the following indelible markings:

- a. Manufacturer's name
- b. Nominal pipe size
- c. Schedule or class
- d. Pressure rating
- e. NSF (National Sanitation Foundation) seal of approval
- f. Date of extrusion

2.03 SOLVENT WELD PRESSURE SUPPLY LINE – PROJECT DATA SHEET 1

- A. Solvent Weld Pressure Supply Line: (downstream of Backflow prevention device) shall be PVC schedule 40 conforming to ASTM D1785-12 for pipe sizes 3/4" through 1 1/2", and PVC Class 315 BE (SDR 13.5) conforming to ASTM D2241 for pipe sizes 2" and larger.
 - 1. Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B.
 - 2. Type 1, Grade 1.
- B. Fittings: Standard weight, Schedule 40, injection molded PVC, complying with ASTM D1784 and D2466, cell classification 12454-B.
 - 1. Threads- Injection molded type (where required)
 - 2. Tees and Ells- side gated
 - 3. Expansive couplings are not allowed by the District.
- C. Threaded Nipples: ASTM D2464, Schedule 80 with molded threads
- D. Joint Cement and Primer: Type as recommended by manufacturer of pipe and fittings

2.04 NON-PRESSURE LATERAL LINES – PROJECT DATA SHEET 2

- A. Non-Pressure Lateral Lines: (downstream of electric remote control valve) PVC Schedule 40, conforming to ASTM D1785-12.
- B. Fittings: Standard weight, Schedule 40, injection molded PVC, complying with ASTM D1784 and D2466, cell classification 12454-B.
 - 1. Threads- Injection molded type (where required)
 - 2. Tees and Ells-side gated
 - 3. Threaded Nipples: ASTM D2464, Schedule 80 with molded threads.
- C. Joint Cement and Primer: Type as recommended by manufacturer of pipe and fittings

2.05 SLEEVING AND CONDUIT – PRODUCT DATA SHEET 3

- A. All sleeving for pressure supply line and non-pressure supply lines shall be twice the nominal size of the pipe within, minimum.
- B. Sleeving and Conduit Material:
 - 1. PVC SCH 40 for 1" to 2-1/2" pressure supply line.
 - 2. PVC SCH 40 for non-pressure lines.
 - 3. (1) one 3/4" PVC SCH 40 conduit for up to 5 wires.
 - 4. (1) one 1-1/2" PVC SCH 40 conduit for up to 8 wires.

2.06 COPPER PIPE AND FITTINGS – PRODUCT DATA SHEET 4

- A. Pressure supply line or Non-Pressure lateral line in structure (per mechanical, structural or mechanical engineers plans): Type K Copper hard tempered, in accordance with ASTM B42-10.
- B. Fittings: Wrought copper, solder joint type.
- C. Joints: Solder shall be made up of 45% silver, 15% copper, 16% zinc and 24% cadmium and solids at 1125° F and liquids at 1145° F.

2.07 BRASS PIPE AND FITTINGS – PRODUCT DATA SHEET 5

- A. Pressure Supply line (from point of connection through Backflow Prevention Device) Brass pipe shall be regular weight, 85% red brass, ANSI Schedule 40 screwed pipe.
- B. Fittings: Medium brass, screwed at 125 pound class.

2.08 ELECTRIC CONTROL VALVES – SCHEDULE 6

- A. Remote Control Valves – PRODUCT DATA SHEET 1: Valve shall be as manufactured by Rainbird Manufacturing Corporation, brass, -no substitutions. Control Valves shall be set in a valve box per Section 3.15 and SCHEDULE 11 – VALVE BOXES in this specification. Mark all control valve boxes with station number.
- B. Valve identification tags – PRODUCT DATA SHEET 2: Shall be pre-printed, double sided standard yellow tags as manufactured by Christy's or approved equal.

2.09 VALVE BOXES – SCHEDULE 8 – PRODUCT DATA SHEET 1

- A. Valve Boxes: Boxes adjacent to paved areas subject to vehicular traffic shall be precast concrete with cast iron lids designed to resist vehicular traffic. Concrete valve boxes shall have lockable covers. Boxes in all other areas shall be plastic valve boxes as follows:
- B. Electric Control Valves, Gate Valves, Ball Valves, Flow sensors, and Master Valves: Rectangular 12" valve box, green in color, with stainless steel hex bolt, including washer, size and type to secure lid. As manufactured by Carson-Brooks Series 1419-12-2B hinged cover or approved equal.

2.10 BUBBLER HEADS – SCHEDULE 9 – PRODUCT DATA SHEET 1

- A. Pre-manufactured Tree and Shrub Bubblers: Use Rainbird RWS bubbler system with bubbler, swing joint, tube and cap. Bubbler system shall include sand sock covering.

2.11 SAND BEDDING – SCHEDULE 11 – PRODUCT DATA SHEET 1

- A. Sand bedding on all piping shall be clean construction grade type.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine field conditions prior to beginning the work of this section. Grading operations shall be completed and approved prior to beginning work.

- B. Verify all sleeve locations prior to beginning work in this section. Flag all existing sleeves and conduits installed by other trades. Report any conflicts and discrepancies to the District Representative immediately.
- C. Verify location of existing underground utilities, valves, manholes, catch basins, and other appurtenances that will affect the layout of the sprinkler system. Verify location of existing trees, new specimen trees, and other obstructions that will affect the layout of the sprinkler system. Verify location of stub outs and points of connection to the water supply system.

3.02 PREPARATION

- A. Locations of piping and equipment indicated on plans are diagrammatic and approximate and shall be adjusted as necessary and as directed to meet existing conditions and obtain complete water coverage. Contractor is responsible for irrigation system operation and complete coverage of the system. Contractor shall report any conflicts and discrepancies to the Architect and District Landscape Inspector immediately.
- B. Sprinkler lines shall have a minimum clearance of 6 inches from each other and from other utility lines. Do not install parallel lines directly over one another.
- C. Construct irrigation system to the sizes and grades at the locations indicated. Mark with powdered lime or marking paint routing of pressure supply line and stake the location of each bubbler head, electric control valve and other related equipment for the first three zones. District Representative shall review staking and direct any necessary changes with Contractor prior to proceeding to other zones. This review does not in any way alleviate Contractor from the responsibilities associated with proper uniformity and distribution of head placement after staking.
- D. Install sleeves to accommodate pipes and wires under paving, hardscape areas, sidewalks, and paths prior to asphalt and concrete operations. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with ASTM D1557. Where not yet utilized, close sleeve ends with cloth duct tape.

3.03 EXCAVATION AND BACKFILLING OF TRENCHES

- A. Follow layout indicated on drawings as closely as possible in excavating trenches. Trenches shall be straight in alignment and support pipe continuously on bottom of trench. Remove rocks and debris greater than 1" in diameter. Over excavate as required for bedding material.
- B. Depth of Trench (in landscape areas):
 - 1. Pressure Supply Line: 18" from top of pipe to finish grade.
 - 2. Non-Pressure Line (for all rotor sprinkler heads and 12" popup heads): 18" from top of pipe to finish grade.
 - 3. Non-Pressure Line (for all non-rotor sprinkler heads and 6" popup heads): 12" from top of pipe to finish grade.
 - 4. Control Wiring: directly at side and bottom of pressure supply line.

5. Pressure Supply line Locator Tape: above pipe, 6" below finish grade, (at a maximum depth of 12").
- C. Depth of Trench (under asphalt paving or concrete, pipe and wires to be in sleeving):
 1. Pressure Supply Line: 36" from top of finish grade to top of sleeve.
 2. Non-Pressure Line: 24" from top of finish grade to top of sleeve.
 3. Control Wiring: Directly at side and bottom of pressure supply line.
 4. Pressure Supply Line Locator Tape: Above pipe, 6" below finish grade, at a maximum depth of 12".
 5. Piping located under asphalt paving or concrete shall be installed with the appropriate sized sleeve. Backfilled with sand bedding (6" below pipe and 6" above pipe).
- D. Width of Trench:
 1. Pipe greater than 3": 14" minimum.
 2. Pipe less than 3": 7" minimum.
- E. Width Between Trenches:
 1. Irrigation trench to irrigation trench: 6" minimum.
 2. Irrigation trench to other trade trenches: 12" minimum.
- F. Sleeves: Provide appropriate sized sleeves for piping located under asphalt paving or concrete.
- G. Boring: Boring is only permitted where pipe must pass under an obstruction that cannot be avoided or removed. Backfill shall match surrounding soil density and grain. Boring under existing paving, sidewalks, or hardscape shall be permitted at Contractor's risk. Contractor shall repair all damage to such items at its own expense.
- H. Backfilling: Backfilling of trenches shall not be done until all required testing for the irrigation system has been completed.
 1. Material: Excavated material is generally considered to be adequate for backfilling operations. Before beginning the backfilling operation, insure that backfill material is free from debris and rocks greater than 3/4" in diameter, and is not mixed with topsoil. These materials after separated from backfill, shall be legally disposed of at Contractor's expense.
 2. Bed pressure supply line with construction grade sand 6" above and 6" below pipe. Remaining backfill shall be as described above.
 3. Bed all electrical control wire, trenched separate from pressure supply line, with construction grade sand 6" above and 6" below wires.
 4. Bed all sleeves with sand bedding with construction grade sand 6" above and 6" below pipe sleeves.
 5. Set in place, cap and pressure test piping in the presence of the District Representative prior to backfilling.
 6. Compact backfill to a 90% maximum density in accordance with ASTM D1557 with a mechanical tamper. Do not leave trenches open for a period greater than 48 hours.

Open trenches shall be protected in accordance with current OSHA regulations. Slightly mound filled trenches for settlement after backfilling is compacted.

7. Smooth trenches to match surrounding finish grade prior to requesting walk through for Substantial Completion.

3.04 POINT(S) OF CONNECTION

- A. Point of connection shall be approximately as indicated on drawings. Connect new underground piping and valves, and provide all flanges, adapters, or other necessary fittings.

3.05 INSTALLATION OF SOLVENT WELD POLYVINYL CHLORIDE PIPE (PVC)

- A. Polyvinyl chloride pipe shall be cut with an approved PVC pipe cutter designed only for that purpose.
- B. All plastic-to-plastic solvent weld joints shall use solvent recommended by the pipe manufacturer. Do not install solvent weld pipe when temperature is below 40° F.
- C. Pipe ends and fittings shall be wiped with MEK, or approved equal, before welding solvent is applied. Welded joints shall be given a minimum of 15 minutes to set before moving or handling.
- D. Snake pipe from side-to-side on trench bottom to allow for expansion and contraction.
- E. All changes of direction over 15 degrees shall be made with appropriate fittings.
- F. When pipe laying is not completed by the end of the workday, close pipe ends with tight plug or cap.
- G. Install pressure supply line locating tape along the entire length of pressure supply line.
- H. Coordinate pressure supply line with sand bedding operations.
- I. No water shall be permitted in the pipe until inspections have been completed and a period of at least 24 hours has elapsed for solvent weld setting and curing.
- J. Center load pipe with small amount of backfill to prevent arching and slipping under pressure. Leave joints exposed for inspection during testing.

3.06 INSTALLATION OF COPPER PIPE

- A. Copper piping shall be cut by a power hacksaw, a circular cutting machine using an abrasive wheel, or by means of a hand hacksaw. No piping shall be cut with a metallic wheel cutter of any description. All pipes shall be reamed and rough edges or burrs removed so that a smooth and unobstructed flow is obtained.
- B. Eccentric reducing fittings shall be used where change in pipe size occurs. Bushings shall not be used unless specifically authorized by the District Representative.
- C. Apply emery cloth to pipe ends and wipe with clean cloth prior to solder welding pipe end to fitting. Apply an even layer of flux along area to be soldered. Apply solder uniformly around joint and let cool. After cooling lightly apply emery cloth along soldered area until smooth.

- D. All exposed piping under structural slabs shall be stenciled with "Irrigation Main" or "Irrigation Lateral" as required, at ten foot (10') intervals in black permanent ink lettering, 3/4" minimum high.

3.07 INSTALLATION OF BRASS PIPE

- A. Brass piping shall be cut by a power hacksaw, a circular cutting machine using an abrasive wheel, or by means of a hand hacksaw. All pipes shall be reamed and rough edges or burrs removed so that a smooth and unobstructed flow is obtained.
- B. Eccentric reducing fittings shall be used where change in pipe size occurs. Bushings shall not be used unless specifically authorized by the District Representative.
- C. Carefully and smoothly place joint compound on the male thread only. All screwed joints shall be tightened with tongs or wrenches. Caulking of any kind is not permitted.
- D. All exposed piping under structural slabs shall be stenciled with "Irrigation Main" or "Irrigation Lateral" as required, at ten foot (10') intervals in black permanent ink lettering, 3/4" minimum high.

3.08 INSTALLATION OF ELECTRONIC CONTROL VALVES

- A. Install each electric control valve in a separate valve box so that cross handle is 3" minimum below valve box cover. Install with union type connection. All plastic valve boxes shall be secured with a stainless steel locking bolt mechanism, and set over 3/4" gravel with filter fabric.
- B. Group electric control valves together with no more than 3 per cluster. Allow a maximum of 12" between each valve box. Install valve boxes in the same direction and parallel with one another and perpendicular to paving, hardscape, sidewalks and paths. Install each manifold group with a ball valve sized equal to the largest non-pressure lateral line in the manifold.

3.09 INSTALLATION OF VALVE BOXES

- A. Install valve boxes with each type of irrigation equipment so that top of valve box is above finish grade as specified on the District Standard Detail drawings. Valve box extensions are not acceptable except for mainline isolation gate valves.
- B. Place gravel sump below and around each valve box prior to installing valve box as specified on the detail drawings. Place remaining portion of gravel inside valve box, allowing full access in and around all fittings. Valve box shall be fully supported by gravel sump.
- C. Brand the valve box lid of associated equipment as follows:
 - 1. Electric control valve box lid with "Controller Letter and Station Number."
- D. Letter and number size of brands shall be no less than 1" and no greater than 1 1/2" in height and shall be 1/8" maximum in depth. Provide sample branding to the District or District Representative prior to commencement of work. Coordinate with District or District Representative any non-listed equipment box identification required.

- E. Walk through for Substantial Completion shall not be allowed until all branding is complete and approved by the District Representative.

3.10 INSTALLATION OF BUBBLERS

- A. Flush circuit piping with full water pressure and install sprinklers after hydrostatic test is completed.
- B. Place RWS devised so that the device is perpendicular to finish grade. Devise cap shall be level and flush with finish grade of decomposed granite material.

3.11 INSTALLATION OF ELECTRICAL WIRE

- A. Low Voltage Wiring:
 - 1. Bury control wiring in same trench as pressure supply line as specified.
 - 2. Bundle all 24 volt wires at 20' intervals with electrical tape.
 - 3. Provide expansion loops at every pressure supply line angle fitting, inside each electric remote control valve box, and at 250' length intervals along routing. Form expansion loop by wrapping wire a minimum of 10 times around a 3/4" pipe and withdrawing pipe.
 - 4. Limit splicing of electrical wiring. Provide each splice made at intervals or in electric control valve assembly valve boxes with approved connectors.
 - 5. Wire splices occurring at intervals outside electric control valve box shall be installed in a separate valve box.
 - 6. Provide (1) one electrical control wire for every electric remote control valve. Piggy backing like zones on the same electrical control wire or into the same station terminal is not allowed.
 - 7. Install (2) two spare #14-1 electrical control wires (with common wire) from the wire pull box to the last electric control valve on each leg of pressure supply line. Locate the spare wires in their own valve box as specified. Provide (1) one additional spare electrical control wire at every electric remote control valve manifold (valve grouping). In addition to these spare wires, check the drawings for additional wires that are required and locate them in the same valve box as the spare wires. Length of spare wires at each end enclosure shall be sufficient for connection into possible fixture equipment or connection point.
- B. High Voltage Wiring: Install 120 volt power source to automatic controller unit following local governing codes and ordinances.

3.12 QUALITY CONTROL

- A. Preconstruction Meeting: Contractor is responsible for contacting the Architect, and District Representative, prior to beginning construction and/or ordering materials, to establish a meeting to review and discuss project objectives, concerns and to review the construction documents to insure a complete understanding of required installation procedures.

- B. General Observation: The District's Inspector will visit the construction site at interim times during the construction process to access construction progress regarding installation of irrigation equipment to be in compliance with the drawings, details, specifications and site conditions. The District's Inspector will prepare a site report after each visit noting progress of installation, verbal communication with Contractor and identifying any field adjustments necessary which require modifications to the designed irrigation system. A copy of this site report will be delivered to both Contractor and the District's Construction Manager. Contractor shall immediately address each item on the site report before proceeding with further construction.
- C. Hydrostatic Pressure Testing the Pressure Supply Line: After backfilling, flushing, and prior to the installation of each electric control valve, drip valve assembly, isolation ball valve, quick coupling valve, and manual drain valve the irrigation system shall be pressure tested.
 - 1. Pressure testing shall be performed in the presence of the Architect and District or District Representative utilizing the following procedure:
 - a. Pressurize the irrigation system to 40 psi greater than the designated static pressure or 150 psi whichever is greater for a period of no less than 4 hours. The pressure gauge used for the pressure test shall not exceed readings greater than 300psi. Pressure pump and other equipment necessary for the test shall be furnished by Contractor.
 - b. Test is acceptable if no leakage occurs within the system for the duration of the testing period.
 - c. If leaks occur, repair said leaks and begin pressure test again. Repeat this operation until no leaks occur in the irrigation system.
 - d. Before requesting a walk through for Substantial Completion, the entire irrigation system shall remain under pressure for a period of no less than 48 hours.
 - 2. Inspection: In cases where inspection of the sprinkler system construction is required or where portions of the construction are specified to be performed under the direction or inspection of the District's Inspector, Contractor is required to notify the District's Inspector at least 3 working days in advance of the time such inspection or direction is required.
 - 3. Inspection will be required for the following parts of the construction:
 - a. Upon installation and testing of main lines; when pipes are laid and are to be submitted to pressure tests. Do not cover lines until they have been inspected and approved.
 - b. Upon installation and testing of valves, quick couplers, control valves, and wires.
 - c. When the sprinkler system is completed, perform a coverage test, in the presence of the District's Landscape Inspector, to determine if the system is complete. Furnish materials and perform construction required to correct inadequacies in the coverage.
 - d. Final inspection and performance test shall be at the same time as the final inspection of the landscape construction.

- D. Flushing: Center load all piping prior to flushing. After all new irrigation piping and risers are in place and connected and all necessary diversion work has been completed and prior to the installation of sprinkler heads, rotors and quick coupling valves, thoroughly flush piping system under full head of pressure. After the furthestmost riser from the point of connection begins to flush, continue flushing for duration of five minutes. After the system is thoroughly flushed, cap all risers.
- E. Repairs required due to vandalism before final acceptance will be performed at the contractor's expense.
- F. Walk Through for Substantial Completion:
 - 1. Before requesting a walk through for Substantial Completion the following requirements must be entirely satisfied:
 - a. The entire irrigation system shall be completely installed, flushed and satisfactorily pressure tested. If Contractor fails to notify the Architect and District Inspector for the pressure test and flushing procedures stated above then Contractor assumes full responsibility for any design modifications directed by the District during the walk through for Substantial Completion regarding pressure and flushing issues.
 - b. All valve boxes shall be branded.
 - c. Record drawings shall have been submitted to the Architect and District for review as to completeness.
 - e. (4) Four Services manuals shall have been delivered to the District or District Representative.
 - 2. Once the above requirements have been met a walk through for Substantial Completion shall be requested. The following procedures shall be used during the walk through:
 - a. Contractor shall have (2) two personnel available with radio communication for the entire length of the walk through.
 - b. All valve box lids shall be removed from valve boxes and placed faced up adjacent to the valve box prior to beginning the walk through.
 - c. The scheduling of each walk through type will be divided over several days as needed to provide adequate time to complete the review of all zones. The walk through will be divided into (2) two sections and proceed as follows:
 - 1) Visual Walk Through: This will consist of walking through the entire irrigation system and examining all components of the system without turning on zones. A punch list will be established of deficiencies in the construction and workmanship of the irrigation system as compared to the construction drawings, details, and specifications.
 - 2) Operational Walk Through: This will consist of walking through the entire irrigation system observing each zone in a fully operable condition. Valves must be activated from the automatic controller unit (Manual bleeding of individual electric control valves and drip valve assemblies will not be acceptable). A punch list will be established of deficiencies in the operation of each zone in the irrigation system evaluating but not limited to correct stationing, and

flushing operation of zones as compared to the construction drawings, details, and specifications.

- 3) Once the Walk Through for Substantial Completion has been completed the Architect will provide a copy of all punch list items to the District for review and distribution to the Contractor. It is the Contractor's responsibility to repair, replace, and adjust all items on the punch prior to requesting a final walk through.

G. Final Walk Through:

1. Before commencement of a final walk through is requested, the following requirements shall be entirely satisfied:
 - a. Each item on the walk through for Substantial Completion shall be thoroughly addressed and resolved by Contractor.
 - b. All final record drawings shall have been provided to the Architect and submitted to the District.
 - c. The maintenance manual for the project shall be completed and submitted to the District.
 - d. Controller charts for each automatic controller unit shall be completed, installed, and submitted to the District.
2. Once the above requirements are met a final walk through shall be requested. The following procedures will be used:
 - a. Contractor shall have (2) two personnel available with radio communication for the entire length of the walk through.
 - b. Only those valve box lids shall be removed from valve boxes as indicated on the walk through for Substantial Completion punch list. The valve box lids shall be placed faced up adjacent to the valve box prior to beginning the final walk through.
 - c. The final walk through shall be divided into (2) two sections and proceed as follows:
 - 1) Visual Walk Through: This will consist of walking through the punch list items created at the time of the walk through for Substantial Completion, examining all components of the system without turning on zones. Any remaining deficiencies in the construction and workmanship of the irrigation system as compared to the punch list generated at the time of the walk through for Substantial Completion, construction drawings, details and specifications will be noted.
 - 2) Operational Walk Through: This will consist of walking through the punch list items created at the time of the walk through for Substantial Completion and observing each zone in a fully operable condition. Valves shall be activated from the automatic controller unit (Manual bleeding of individual electric control valves and drip valve assemblies will not be acceptable). Any remaining deficiencies in the operation of each zone in the irrigation system including but not limited to correct stationing, and flushing operation of zones as compared

to the punch list generated at the time of the walk through for Substantial Completion construction drawings, details, and specifications.

- 3) Once the Final Walk Through is completed and all items noted on the final punch list have been addressed the maintenance period shall begin. Any additional site walks required due to Contractors' inability to address all issues on the punch lists described above will be provided at Contractor's expense.

3.13 MAINTENANCE PERIOD

- A. The Maintenance Period shall be as indicated in the Agreement and shall be 90 days or greater. It shall begin once all items on the final walk through punch list have been satisfactorily addressed by a written statement indicating such from the Architect and the District.
 1. Contractor is responsible for obtaining and following the maintenance manuals created specifically for the project from the District at the beginning of the maintenance period.
 2. Demonstrate to District's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review maintenance information.
 - a. Provide seven days' advance written notice of demonstration.
 3. At the end of the maintenance period and prior to turning the project over to the District, Contractor shall deliver the following to the District:
 - a. All necessary maintenance materials.
 - b. Extra stock as specified elsewhere in this Section.
 4. Once Contractor has fulfilled all maintenance agreement obligations and has provided the above items to the District, the maintenance period will end.

END OF SECTION

SECTION 32 93 00

PLANTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Planting and maintenance as indicated on the drawings and specified herein.

1.02 PERFORMANCE REQUIREMENTS

- A. Control: The selection of herbicides, application rates and methods are to be performed under the control and guidance of a licensed pest control advisor and applicator in the State of California.

1.03 QUALITY ASSURANCE

- A. Provide laboratory soils analysis conforming to the following:
 - 1. Submit two representative samples of native soil within the project limits as soils samples to the laboratory at the commencement of work, after rough grading.
 - 2. Place each sample in a sturdy container, properly identified, labeled, and dated.
 - 3. Provide report of results to the District Representative, the Architect, and Contractor. The test shall include a fertility and suitability analysis with written recommendations for soil preparation, backfill mix, auger hole requirements, maintenance and post-maintenance fertilizer requirements. The results of this test shall supersede the amendment and fertilizer schedule specified herein and no planting shall be done until the Architect approves the soils test recommendations.
- B. Testing services shall be paid for by the Contractor.

1.04 FIELD CONDITIONS

- A. Scaled dimensions are approximate. Check and verify site dimensions and receive District Representatives approval prior to proceeding with work under this section.
- B. Coordinate installation of plant materials, to avoid interference with other construction.
- C. Maintain premises clean and free of excess equipment, materials and debris incidental to work.
- D. Protect existing facilities and work of others at times in performance of work.
- E. Carefully note all finish grades before commencing work. Restore finish grade changed during course of this work to original or intended grades.

1.05 QUALITY ASSURANCE

- A. Inspections: Plants shall be subject to inspection and acceptance at place of growth or upon delivery to the site, for quality, size and variety. Such acceptance shall not impair the right of inspection and rejection at a later time or during progress of work, for size, condition of rootball, and latent defects or injuries. Immediately remove rejected plants from the site.

Trees, 24 inch box size and larger, shall be accepted by the District Representative prior to delivery.

- B. The following inspections shall be made by District Representative. Request inspection in writing at least two working days in advance of the time inspection is required:
 - 1. Plant material placement prior to installation.
 - 2. Preparation of Punch List prior to maintenance period.
 - 3. Final observation for completion.
- C. The Contractor, or his authorized representative, shall be on site at the time of each inspection.
- D. If the Contractor requests an inspection and the site is not in an acceptable condition to hold the inspection, the hourly fees of the personnel called for the inspection shall be paid by the Contractor. No site visits will be scheduled until these fees have been paid.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Submit at time of delivery invoice statements certifying quantities by bulk and/or weight, for all organic amendments and fertilizers. Submit suppliers' certificates of compliance with these specifications. Random samples may be taken by the District Representative for analysis.

1.07 GUARANTEE AND REPLACEMENT

- A. Plantings: Guarantee planting until end of maintenance period and acceptance. Replace trees or plants that die or lose form and size as originally specified even though they have taken root and are growing after the dieback or loss of form or size.
- B. Trees: Guarantee 15 gallon trees and larger, in writing, to live in a healthy condition for one year after final inspection and acceptance by the District. Replace dead or unhealthy trees immediately. Replacements, including planting, staking, training, etc., shall be as originally specified, without cost to the District.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide materials of best quality obtainable, which comply strictly with Drawings and specifications.

2.02 SOIL AMENDMENTS (for bidding – prior to soils report)

- A. Organic Amendment: Derived from wood or bark, granular in nature, stabilized with nitrogen and fortified with minerals, and having the following properties:
 - 1. Organic Content: Minimum 90% by weight.
 - 2. Particle Size: Minimum 95% passing 4 mesh screen; Minimum 80% passing 8 mesh screen.
 - 3. Nitrogen Content: 0.5% based on dry weight for redwood sawdust. 0.7% based on dry weight for fir sawdust. 1.0% based on dry weight for fir or pine bark. NOTE: Pine sawdust is not acceptable.

4. Mineralized: 0.1% total iron.
5. Salinity: Maximum conductivity 3.5 mm/cm at 25 degrees C.
- B. Fertilizer and Minerals:
 1. Soil sulfur: Minimum 95% elemental sulfur.
 2. Ferric Sulfate: Fe₂ (SO₄)₃ minimum 20% Fe, as metallic.
 3. Commercial Fertilizer:
 - 38-0-0 Urea formaldehyde (Soil preparation)
 - 12-12-12 (Soil preparation)
 - Ammonium sulfate 21-0-0 (Weed abatement)
 - 16-6-8 (Maintenance)
 4. Planting Tablets: Gro-Power 12-8-8 slow release tablets.
 5. Gro-Power Plus: 5:3:1, 50% humus, 2% soil penetrant PH 4.5 - 4.7

2.03 PLANT MATERIALS

- A. Quantity and size of plants as stated on the Plans and Plant Legend. No root bound materials allowed. Plants shall be fresh and vigorous, of normal growth, and free of diseases, weeds, harmful insects, or their insect eggs and larvae.
- B. Plants are subject to inspection for approval or rejection at place of growth and/or on project site at any time before or during progress of work for size, variety, condition, latent defects and injuries. Remove rejected plants from site immediately and replace with approved plants.
 1. Protection: Protect plants from damaging sun and wind. Damage will be cause for rejection even after initial approval.
 2. Substitutes: Not permitted unless specifically approved in writing.
 3. Nomenclature: Conforms to customary nursery usage.
 4. Quantities: Provide materials as needed to complete indicated work.
- C. Sodded Grass:
 1. Shall be TPI, Certified Turfgrass Sod quality, cultivated grass with strong fibrous root system, free of stones, burned or bare spots, containing no more than 5 weeds per 1000 s.f. - minimum age of 18 months with root development that will support own weight without tearing when suspended vertically by holding the upper corners.
 2. Variety shall be as specified on the Drawings. Sod shall be free from disease, insects, noxious weeds or other grasses. Sod shall be grown in sand or sandy loam soils only. Sod grown in clay, silt or high organic material shall not be used.
 3. Sod shall be field cut with a minimum of 5/8" of soil that completely covers the sod roots. Sod shall arrive in vigorous condition with a lush appearance

2.04 STAKING MATERIALS

- A. Tree Stakes: Sound treated pine and uniform size, dimension and diameter, pointed at one end. Quantity and size of stakes shall be as shown on the Drawings.
- B. Ties: Cinch-Tie or District approved equal. Secure to tree as detailed.

2.05 INERT MATERIALS

A. Inert Mulch – Decomposed Granite:

1. Inert mulch for planting areas and circulation areas shall be decomposed granite. It shall be clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock. Do not use limestone screenings or stone dust that do not conform to the grading requirements shown below. Color shall be as specified on the Drawings. Crushed stone sieve analysis ASTM D422 shall be as follows:

<i>SIEVE DESIGNATION</i>	<i>PERCENT PASSING</i>
3/8"	100
No. 4	95-100
No. 8 (2.36 mm)	75-80
No. 16 (1.18 mm)	55-65
No. 30 (0.600 mm)	40-50
No. 50 (0.300 mm)	25-35
No. 100 (0.150 mm)	15-20
No. 200 (0.075 mm)	10-15

2. Submit inert mulch samples for planting areas and circulation areas to Architect and District's Representative for approval.

B. Stabilizer Binder (use with decomposed granite surface):

1. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite together to produce a firm surface.
2. Provided by: KRC Rock Inc., San Marcos, California (800) 572-7625, or District approved equal.

2.06 WEED BARRIER FABRIC

- ### A.
- Weed barrier shall be a 5.3 ounce heavyweight UV stabilized non-woven polypropylene landscape fabric, as manufactured by Phillips Fibers Corporation or District approved equal. Needle punched material is not acceptable.

2.07 CHEMICAL CONTROLS

- ### A.
- Pre-emergence Herbicide: Acceptable manufacturers include, but are not limited to the following: Surflan, Treflan or Dymid
- ### B.
- Weed Contact Spray: Acceptable products include, but are not limited to: Phytar, 560 Broadside.

2.08 TREE ROOT PROTECTION

- ### A.
- Root barriers are available from, but not limited to, Deep Root Corporation and shall be as follows:

1. 15 gallon trees: #UB24 – two with 4 panels required.
2. 24 inch box trees: #UB24 – two with 5 panels required.
3. 36 inch box trees: #UB24 – two with 7 panels required.
4. 48 inch box trees and larger: Per manufacturer's recommendations.

PART 3 - EXECUTION

3.01 PRELIMINARY GRADING

- A. General: Do not work soil when the moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form or that clods will not break readily. Apply water if necessary to provide ideal moisture content for tilling and planting. Perform preliminary grading in such a way as to anticipate the finish grade after the installation of soil conditioners. Remove or redistribute excess soil before application of soil amendments.
- B. Finish: Grade planting areas to a level of 2 inches below the adjacent pavement surface. Where no grades are shown, grade between existing or fixed controls (such as walks, curbs, catch basins) and elevations shown to provide a smooth and continual plane. Rake and level as necessary to obtain true and even surfaces. Verify all swales on Engineer's Plan, and grade to drain.
- C. Remove and dispose of rocks over 3/4" inch diameter within top 12 inches of soil, construction debris, weeds, etc. within the limits of the project prior to applying soil amendments.

3.02 SOIL PREPARATION FOR LEVEL PLANTING AREAS

- A. Quantities: The following amendments are for bidding purposes only. Actual quantities and mixes shall be determined in accordance with the soils report obtained per Item 1.03 above. Uniformly apply to each 1,000 square feet of planting area:
 - 50 pounds 'Gro-Power Plus'
 - 6 cubic yards on-site soil
 - 15 pounds soil sulfur
 - 8 pounds 12-12-12
- B. Distribution: Distribute the organic amendment and fertilizer over the planting area to a uniform depth of 2 inches. Secure approval from District Representative prior to working amendments into soil. No credit for organic amendment will be given if this procedure is not used.
- C. Cultivation: Work into soil by cultivation, spading or rototilling to a depth of at least 6 inches. Finish grades to smooth finish 2 inches below adjacent paving and curbs. Remove debris and weeds from site.

3.03 BACKFILL MIX

- A. Stockpile a sufficient quantity of approved soil found on site, free of weeds and debris, for mixing as backfill material. Supplement on-site soil with approved import soil, as required. Mix amount for 10 cubic yards as follows: Note: The following amendments are for bidding

purposes only. Actual quantities and mixes shall be determined in accordance with the Soils Report obtained per Item 1.03 above.

- 6 cubic yards on-site soil
- 4 cubic yards organic amendment
- 20 pounds ferric sulfate
- 10 pounds 12-12-12
- 180 pounds 'Grow-Power Plus'

- B. Use care not to stain concrete with ferric sulfate. Cleaning of stained concrete is the responsibility of Contractor.

3.04 WEED ERADICATION

- A. Perform the following procedures for irrigated planting areas:

1. Spot spray perennial weeds with a non-selective systemic contact herbicide. "Round-Up" or District approved equivalent.
2. Manually remove remaining covers and weeds, and dispose off-site.
3. Fertilize planting areas with Ammonium Sulfate at 4 lbs./1000 s.f. or equivalent fertilizer to promote re-growth.
4. Apply irrigation at a rate sufficient to promote weed growth for a period of 2 to 3 weeks.
5. When weed seeds have germinated and grown to a height of 2 inches, discontinue irrigation for a period of three (3) days to prepare the areas for access.
6. Spray weeds with a non-selective contact herbicide, and spray Bermuda Grass and Morning Glory with a non-selective systemic herbicide. Apply no water for a minimum of four (4) days following application of contact weed killer.
7. Allow a sufficient period of time to ensure that weeds are dead. Follow herbicide manufacturer's directions.
8. Lightly irrigate planting areas for a period of 2 to 3 weeks, without causing erosion of soils.
9. Spot spray weed re-growth with non-selective contact herbicide.
10. Plant container stock (no rooted cuttings).
11. Evenly distribute specified soil amendments to areas.
12. Water planting areas for three (3) consecutive days to moisten upper layers of soil prior to hand seeding operation without causing erosion to the soils.
13. Allow planting area soil surface to dry out for one day only prior to the hand seeding application. Do not allow the soil surface to be super saturated with water or excessively dry prior to hand seeding. Verify that residual moisture lies within the first 1/2-inch of the soil surface.
14. Plant rooted cuttings and hand seed areas as specified.

3.05 PLANTING

- A. Pre-Plant Approvals: Obtain approval of planting holes, pre-mixed backfill, plants, and locations prior to planting.

1. Trees and shrubs shall not be planted until construction work in the area has been completed, final grades established, and the planting areas properly graded and prepared.
2. Stake plant locations or place approved quantities of plants in containers on locations. Secure approval before excavating pits, making necessary adjustments as directed.

3.06 INSTALLATION

- A. Install plant materials as soon as site is available and weather conditions are suitable. Do not plant when weather conditions are unfavorable to do good work, or if soil is excessively wet. Protect plants from sun, wind and rain at all times prior to and during planting.
 1. Excavate pits with scarified vertical sides and bottom, no smaller than the following sizes:
 - 1 Gallon plants - 8" deep, 12" in diameter
 - 5 Gallon plants - 12" deep, 24" in diameter
 - 15 Gallon plants - 18" in diameter
 - Boxed Trees - depth of rootball - 24" wider than rootball
 2. Partially refill hole to a height that when a plant is placed, the crown is slightly above the finished grade to allow for decomposed granite cover. Use friable un-amended soil for all boxed trees, specified backfill mix for other container plants, and tamp to compact.
 3. Fill hole with water prior to installing plant.
 4. Deposit Gro-Power 12-8-8 tablets in plant pits as described in planting notes.
 5. Set plants in center of pits in vertical position so that the crown of plant is slightly above the finished grade, and backfill with prepared backfill mix.
 6. Form shallow basin around edge of plant ball by depressing soil slightly below finished grade. Form basin rims. Keep basin within outer edges of plant ball.
 7. Individually hand water each plant to saturate rootball and adjacent soil immediately after planting.
 8. Adjust for settlement and grade areas around plants to finish grades and dispose of excess soil.
 9. Stake trees designated with stake or stakes on windward side of tree as detailed.
- B. Install turf in all designated areas as follows:
 1. Roll and rake lightly until surface is smooth, friable, and of uniformly fine texture immediately before planting grass.
 2. Sod: Where indicated on Drawings, fully mature, well maintained, approved grade Bermuda, 'Tifgreen' 328, free of all other grasses or weeds, and evenly cut to a thickness of 5/8-inch. All material shall be from the same growing ground and delivered fresh to the job site. Source: Pacific Sod, telephone (800) 762-3027 or (800) 942-5296.
 3. Watering: Frequently water with fine spray to obtain uniform soaking. Maintain uniform moisture until sod has rooted. Do not flood with water.
 4. Protection: Protect all turf areas against damage, including erosion and trespass. Provide whatever facilities and safeguards necessary to accomplish this. Take special care to prevent erosion. All damages shall be the Contractor's responsibility during the life of the Contract.

- C. Irrigation: A sprinkler system is provided in areas for maintaining general moisture requirements. Hand watering of newly planted trees and shrubs will; however, be required once every week for three weeks. Check plants for adequate moisture at the roots. Water as required throughout the maintenance period.

3.07 INERT MULCH FOR PLANTING AREAS

- A. Decomposed Granite:
 - 1. Complete finish grading and compaction of sub-grade in planting areas prior to application.
 - 2. Install weed barrier fabric as recommended by manufacturer.
 - 3. Install decomposed granite in areas shown on the drawings to a minimum 2-inch depth. Grade smooth and apply water until moisture penetrates full depth of material.
 - 4. Compact decomposed granite in planting areas to an 85% relative density.
 - 5. Apply "Eptam pre-emergent to the top lift.

3.08 MAINTENANCE

- A. Maintenance shall begin immediately after each plant is planted, and shall continue for at least 90 days after acceptance of completion of landscaping and irrigation and as much longer as is necessary to establish thriving plants.
- B. Irrigation Maintenance:
 - 1. Review existing system with District personnel for satisfactory operation and coverage.
 - 2. Properly and completely maintain irrigation systems, clean lines, valves, heads and other portions of such systems to assure their continual proper operations. Lubricate as needed.
 - 3. Make adjustments necessary to avoid overspray onto buildings and pavements.
 - 4. Program controller on a weekly basis considering weather, the water requirements of each sectional valve, and the application rate each area is capable of receiving, without runoff.
 - 5. Coordinate irrigation activities with District personnel. Specify programming and shut down for repairs.
- D. Planting Maintenance:
 - 1. Fertilization: Apply 6 pounds per 1,000 square feet of 16-6-8 commercial fertilizer to planting areas 20 and 50 days after planting.
 - 2. Cultivation and Weeding: After period of more or less continuous watering, during which soil moisture is maintained at near saturation point, cultivate all ground cover areas by scarifying the surface 1 inch. Do not change grade, remove basins or berms in the process of such cultivation. Follow the cultivating by a period of non-irrigation, to aid the killing off of weeds, and soil aeration.

3. Pruning and Staking: Unless otherwise directed, prune only to remove dead or broken branches of trees or shrubs. Re-stake, re-align and re-tie all trees as necessary.
4. Insect Management: Examine all plants frequently, especially any which are subject to common insect depredation such as aphids, meanly bugs, ants, etc., to establish need for counter measures. Wash foliage with strong streams of water. Notify the Owner's representative if further measures seem warranted.
5. Replacement: Immediately replace and plant materials which for reason are damaged or die during the maintenance period. Replace as originally specified.
6. Protection: Protect planting against damage, including erosion, rodents, and trespass, providing proper safeguards as needed. Repair damage to the work made by pedestrians, animals, vehicular traffic, or other cause until acceptance.
7. Mowing: Mow turf areas with rotary or reel type mowers per turf suppliers recommendation. Provide a final mowing one day prior to final maintenance period inspection.

3.09 CLEANING

- A. Upon completion of construction, and before final acceptance, broom-clean the entire area within the contract limits. Remove tools, surplus materials, equipment, debris, etc. and leave the site in a neat and acceptable condition.
- B. Paved Areas: Clean paved areas of debris or silt by sweeping and hosing.

3.10 SITE REVIEW

- A. Final review (to insure that fire department appliances are not obstructed) of all planting will be made at the conclusion of the maintenance period. Submit written notice to District Representative at least seven days before acceptance date.

END OF SECTION