Administration Building Renovation
Dibble Adult School

tBP Project No. 21206.00
Bid No:

Hacienda-La Puente Unified School District
City of Industry, California

PROJECT MANUAL

Divisions 00 - 32
February 2025

Architect:
tBP/Architecture
4611 Teller Ave. Newport Beach, CA 92660-2104
949. 673. 0300

tBP
Architecture
Planning
Interiors
Management

SECTION 00 01 01
PROJECT TITLE PAGE

ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL

HACIENDA LA PUENTE UNIFIED SCHOOL DISTRICT

15959 E. GALE AVENUE, CITY OF INDUSTRY, CA 91745

626.933.1000

WWW.HLPSCHOOLS.ORG

PROJECT LOCATION

DIBBLE ADULT SCHOOL

1600 PONTENOVA AVENUE

HACIENDA HEIGHTS, CALIFORNIA 91745

PREPARED BY:

ARCHITECT

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

949.673.0300

www.tbparchitecture.com

Architect's Project Number: 21206.00.

END OF PROJECT TITLE PAGE

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Architect's Project Number: 21206.00.

Dibble Adult School.

1600 Pontenova Avenue.

Hacienda Heights, California91745.

B. The Owner, hereinafter referred to as District:

Hacienda La Puente Unified School District

15959 E. Gale Avenue, City of Industry, CA 91745

www.hlpschools.org

626.933.1000

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 of existing classrooms.

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: **tBP/Architecture**

4611 Teller Avenue, Newport Beach, CA 92660

www.tbparchitecture.com

949.673.0300

1.05 PROCUREMENT TIMETABLE

A. Last Request for Substitution Due: 14 days prior to due date of bids. Unless stated otherwise in Bid Documents.

B. Last Request for Information Due: 14 days prior to due date of bids. Unless stated otherwise in Bid Documents.

C. Contract Time: To be stated in bid documents.

D. 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

ARCHITECT OF RECORD (AOR)

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

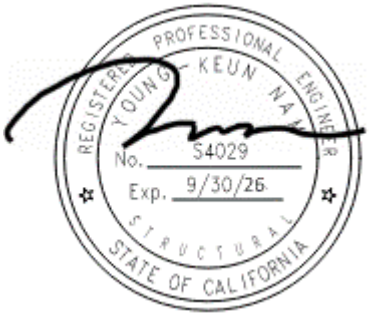
Hung Cheng C-34187

STRUCTURAL ENGINEER OF RECORD (SEOR)

VCA ENGINEERS, INC.

2551 Michelson Drive, Suite 240, Irvine CA 92612

Young-Keun Nam S-4029



MECHANICAL ENGINEER OF RECORD (MEOR)

POCOCK DESIGN SOLUTIONS

14451 Chambers Road, Suite 210, Tustin, CA 92780

Andrew Gossman M-35839

ELECTRICAL ENGINEER OF RECORD (EEOR)

FBA ENGINEERING

150 Paularino Avenue, Suite A120, Costa Mesa CA 92626

Stephen Zajicek, PE E-10372

CIVIL ENGINEER OF RECORD (CEOR)

FPL & ASSOCIATES

30 Corporate Park, Suite 401, Irvine, California 92606

Alan Wing-Chi Lee, CE C-34971

END OF SECTION

SECTION 00 01 10
TABLE OF CONTENTS

END OF SECTION

SECTION 00 40 25
REQUEST FOR INFORMATION (PREBID)

RFI NUMBER: _____ DATE: _____

PROJECT NAME: ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL PROJECT NO.: 21206.00

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

Attention: _____

Contractor: _____

Address: _____

Request By: _____ Date: _____

BRIEF SUMMARY OF RFI:

Drawing No. _____ Detail No. _____

Specification Section No. __ __ __ Title _____

Article / Paragraph _____ Page _____

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: ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL

PROJECT NUMBER: 21206.00

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

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: _____

Specification Section No. __ __ __ Title _____

Article / Paragraph _____ Page _____

Drawing No. _____ Detail No. _____

PROPOSED SUBSTITUTION: _____

Manufacturer: _____ Tel: _____

A. Is the point-by-point comparative data attached? **REQUIRED BY A/E** - No__ Yes__

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 Architect and Engineer document changes are the responsibility of the Contractor.*)

Explain:

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: ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL

PROJECT NUMBER: 21206.00

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

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 under conditions beyond control of Contractor.

SPECIFIED PRODUCT: _____

Specification Section No. __ __ __ Title _____

Article / Paragraph _____ Page _____

Drawing No. _____ Detail No. _____

PROPOSED SUBSTITUTION: _____

Manufacturer: _____ Tel: _____

A. 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 Architect and Engineer document changes are the responsibility of the Contractor.*)

Explain:

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*)

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

G. 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: _____

District: _____ Date: _____

Division of the State

Architect: _____ Date: _____

END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Administration Building Renovation Dibble Adult School

B. District's Name: Hacienda La Puente Unified School District.

C. Architect's Name: tBP/Architecture.

D. The Project consists of the alteration of existing one-story building and related site work located at Dibble Adult School.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Owner-Contractor Agreement.

B. The Work is construction and related services for a , CBC, Occupancy Type Assembly Group A-2 and Business Group B, Construction Type V-B, , totaling approximately 6,913 square feet.

1. The Work includes new building construction, interior improvements, building utilities, and related site improvements; with patch and repair as required, and other features to the extent indicated on the Drawings.
2. Hazardous Material Abatement is specified in a separate document prepared by the District's Consultant and is not managed by the Architect or the Architect's Consultants.

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 the technical Divisions 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. Electrical Power and Lighting: 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 Date of Final Inspection. Some items include:

1. Movable cabinets.
2. Furnishings.
3. Small equipment.
4. Rugs.
5. Artwork.

C. OFCI - District will supply the following for installation by Contractor:

1. 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, for a complete installation.
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 by the date stated in the Agreement as the contract completion date.

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 ofespecially noisy malodorous and dusty exterior work to the hours of 8 AM to 6 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.

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 21 00 - Allowances: Payment procedures relating to allowances.

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

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: 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. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.

1. Submit schedule in a spreadsheet calculated format, such as Excel, based upon the attached Schedule of Values augmented by the Table of Contents of this Project Manual.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification section. Identify site mobilization, bonds and insurance, and record drawings .

E. Where work is separated into phases requiring separately phased payments, provide separate schedule for each phase.

F. Where work involves multiple sites and/or "A" number, provide separate schedules for each site and/or "A" number.

G. Where scope of work involves multiples buildings/structures, provide separate schedule for each building.

H. Include in each line item, the amount of Allowances specified in this section.

I. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

J. 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 Form as provided by District.

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 32 16.
   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 per CAC Sec 4-338(b).

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), & 4-338(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 Directive approval is required from DSA prior to installation.
4. 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 DSA 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 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Contingency allowance.

C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts, less cost of delivery to site , less applicable taxes .

B. Architect Responsibilities:

1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
2. Select products in consultation with District and transmit decision to Contractor.
3. Prepare Change Order.

C. Contractor Responsibilities:

1. Assist Architect in selection of products, suppliers , and installers.
2. Obtain proposals from suppliers and installers and offer recommendations.
3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

D. Differences in costs will be adjusted by Change Order.

1.04 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.05 ALLOWANCES SCHEDULE

A. Contingency Allowance: Include the stipulated sum/price of $50,000 for use upon Owner's instructions.

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. Submittal Time Restrictions:

1. District will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

C. 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 .

D. 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.

1. Substitutions affecting DSA-regulated items shall be considered as construction change documents (CCD's) and shall be approved by DSA prior to construction per DSA IR A-6 and Section 338(c) Part 1, Title 24 CCR. See Section 01 20 00 - Price and Payment Procedures.

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. Contractor's daily reports.

G. Progress photographs.

H. Coordination drawings.

I. Submittals for review, information, and project closeout.

J. Number of copies of submittals.

K. Requests for Interpretation or Information (RFI) procedures.

L. 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 Owner Representative and Architect or other responsible design professional.

B. Informational Submittals: Written information that does not require responsive action by Owner Representative 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 REFERENCE STANDARDS

1.05 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. Manufacturer's instructions and field reports.

6. Applications for payment and change order requests.
7. Progress schedules.
8. Coordination drawings.
9. Correction Punch List and Final Correction Punch List for Final Inspection.
10. 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.
4. Owner Representative.

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.
9. Scheduling activities of a Geotechnical Engineer.

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. Special consultants.
6. Contractor's superintendent.

7. Major subcontractors.
8. Inspector of Record.
9. DSA Field Representative.

C. Agenda:

1. Designation of Key Personnel: Contractor shall designate key personnel and provide a name and address list which includes the following:
    a. Contractor: Project Manager and Superintendent.
    b. Major subcontractors: Principal/Project Manager and Superintendent.
    c. Major materials suppliers: Contact person.
2. Distribute and discuss list of subcontractors and suppliers.
3. 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.
4. 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.
5. 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.
6. District's requirements.
7. Construction facilities and controls provided by District.
8. Temporary utilities provided by District.
9. Survey and building layout.
10. Security and housekeeping procedures.
11. 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 (OFCI) products;
    c. Work under separate contracts by serving utility agencies;
    d. Work under separate contracts by companies and District.
12. Review requirements for Contractor's coordination of Work; review sequence and schedule for work being performed for District under separate contracts.
13. Submittals Administration: Review administrative procedures for shop drawings, product data and samples submittals and review of preliminary Submittals Schedule.

14. Materials and Equipment:
    a. Review substitution requirements;
    b. Review schedule for major equipment purchases and deliveries;
    c. Review materials and equipment to be provided by District (OFCI products).
15. Permits and Fees: Review Contract requirements and review schedule and process for obtaining permits and paying fees.
16. Application for payment procedures.
17. Procedures for testing.
    a. Review tests and inspections to be performed by the following:
        1) Independent testing and inspection agency.
        2) Manufacturers and installers.
        3) Serving utilities and public agencies.
        4) Authorities having jurisdiction.
18. Procedures for maintaining record documents.
19. Requirements for start-up of equipment.
    a. Operation and Maintenance Data:
        1) Format and content of operation and maintenance manuals; instruction of District's personnel.
20. 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. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.

C. Special Meetings: As necessary, Owner Representative 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. Special consultants.
    6. Contractor's superintendent.
    7. Major subcontractors.

8. Inspector of Record.

E. Agenda:

1. Review minutes of previous meetings.
    a. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
    b. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
    c. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.
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. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and District's review.

C. Reviews by Architect and District 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.

D. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

E. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

F. Within 10 days after joint review, submit complete schedule.

G. Submit updated schedule with each Application for Payment.

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 Final Inspection.
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 1024 by 768, 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. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
6. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 COORDINATION DRAWINGS

A. See Section 01 31 14 - Facility Services Coordination.

B. Provide information required by Project Coordinator for preparation of coordination drawings.

C. 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.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
    b. Allow time for shipping and distribution to involved parties. Minimum 1 day, including those sent by electronic transmission.

6. Posting: Post one copy of most recent Submittals Schedule in Contractor's field office, readily available to District, Owner Representative, and Architect. Update bi-weekly with project schedule.
7. Archive: Preserve a minimum of two copies of all superseded schedules, with one copy available at field office for review by District or Architect.

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 COMMISSIONING

A. The Commissioning Authority will receive a copy of the standard submittals for equipment to be commissioned.
B. The Commissioning Authority may require additional documentation necessary for the commissioning process. The Contractor will receive a written request from the Commissioning Authority for specific equipment or system information.

3.14 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.Final Inspection.
B. Submit Final Correction Punch List for Final Inspection.

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.

3.15 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. Extra Copies at Project Closeout: See Section 01 78 00.
C. 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.

3.16 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.
    c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 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.

3.17 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", "Reviewed", 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", "Reviewed 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 (INFORMATION)

RFI NUMBER: _____ DATE: _____

PROJECT NAME: ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL

PROJECT NO.: 21206.00

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

Attention: _____

Contractor: _____

Address: _____

BRIEF SUMMARY OF RFI:

Drawing No. _____ Detail No. _____

Specification Section No. __ __ __ Title _____

Article / Paragraph _____ Page _____

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
	Fire Sprinkler		Food Service		Theater
	Civil		Landscape		other consultants

END OF RFI

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

C. Summary schedule.

D. Weekly/Short term (Look Ahead) Schedule.

1.02 RELATED SECTIONS

A. Section 01 10 00 - Summary: Work sequence.

B. Section 01 30 00 - Administrative Requirements: Submittal Schedule.

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM.

1.04 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. Submit two copies to Owner Representative and one copy to Architect.

C. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

D. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

E. Within 10 days after joint review, submit complete schedule.

F. Submit updated schedule with each Application for Payment.

1. Revise schedule also upon issuance of Change Orders and Construction Change Directives which substantially affect construction sequence or schedule.

G. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

H. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year's minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1. Designate the Scheduler in writing and within ten (10) workdays after Notice of Intent to Award, as the qualified responsible person for preparation, maintenance, updating, and revision of all schedules for the full term of construction.
2. Scheduler:
    a. Dedicated to this project and available on-site as needed to meet the strict requirement of this spec. section.
    b. All scheduling software and hardware located on-site.
    c. Scheduler will attend all project meetings called for as specified in Division 01.
3. Qualifications of responsible person:
    a. Knowledge of critical path method (CPM) scheduling utilizing Primavera P6 latest release software.
4. References:
    a. Submit written reference of three (3) project Owners who have personal experience with this scheduler on previous projects.
    b. Identify name, address, telephone number, project name, and cost.
5. District reserves the right to disapprove Scheduler when submitted by Contractor based on his/or her sole discretion.District reserves the right to remove Scheduler from the project without cause.

B. Contractor's Administrative Personnel: Three years minimum experience in using and monitoring CPM schedules on comparable projects.

C. Reviews by Architect and Owner Representative: Reviews by Architect and Owner Representative 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.

D. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and District's review.

E. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.

1. Changes in the Work shall not be authorized by submittals review actions.
2. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
3. Changes shall only be authorized by separate written Change Order or Field Change Directive, in accordance with the Conditions of the Contract.

1.06 SCHEDULE FORMAT

A. Format: Prepare schedules in format at Contractor's option, either bar chart, PERT or GANTT format, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
   1. Prepare schedules in MS Project or Primavera.
   2. Provide clear indication of sequencing and scheduling of work for determination of "critical path" of construction progress.
   3. Present schedule in both electronic and reproducible paper formats with sheet size large enough to clearly read the characters.

B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

C. Diagram Sheet Size: Maximum 30 x 42 inches.

D. Sheet Size: Multiples of 8-1/2 x 11 inches.

E. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

B. Prescheduling Conference:
   1. Owner Representative will conduct a conference within fifteen (15) work days after the Notice of Intent to Award.
      a. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
         1) Review software limitations and content and format for reports.
         2) Verify availability of qualified personnel needed to develop and update schedule.
         3) Discuss constraints, including phasing work stages area separations interim milestones and partial District occupancy.
         4) Review delivery dates for District-furnished products.
         5) Review schedule for work of District's separate contracts.
         6) Review submittal requirements and procedures.
         7) Review time required for review of submittals and resubmittals.
         8) Review requirements for tests and inspections by independent testing and inspecting agencies.
         9) Review District's IT requirements for installation of their Work.

10) Review time required for Project closeout and District startup procedures, including commissioning activities for MEP, Security Electronics Equipment.

11) Review and finalize list of construction activities to be included in schedule.

12) Review procedures for updating schedule.

C. At the meeting, the Owner Representative will review scheduling requirements. These include schedule preparation, reporting requirements, labor and equipment loading, updates, revisions, and schedule delay analysis.

1. The Contractor will present schedule methodology, planned sequence of operations, resource loading methodology, and proposed activity coding structure.

D. Coding structure:

1. Submit proposed coding structure, identifying the code fields and the associated code values it intends to use in the project schedule.

2. A minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/Construction and Responsibility/Subcontractor.

a. Refer to NETWORK DETAILS AND GRAPHICAL OUTPUT for listing of activity categories to be included in the schedule.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

1. Identify Work of separate buildings, phases, units or other logically grouped activities to facilitate review of Application for Payment with completed Work.

D. Provide sub-schedules for each stage of Work identified in Section 01 10 00 - Summary.

E. Provide sub-schedules to define critical portions of the entire schedule.

F. Include conferences and meetings in schedule.

G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

1. Format: Prepare Submittals Schedule in a format comparable to Construction Progress Schedule, specified in Article above.

2. Content: List all items specified to be submitted, indicating submittal number (see instructions specified in Section 01 30 00 - Administrative Requirements, submittal type (i.e., product data, shop drawings, sample, quality control report, maintenance and operating data, etcetera), scheduled date submittal is to be made and date review should be complete in order to maintain construction on schedule.

3. The Contractor shall submit to the Architect a schedule of the shop drawings that lists their required submission and approval dates.
    a. Allow minimum one (1) week for the Architect to review the submittals. Some submittals may require a longer review period. See Section 01 30 00 - Administrative Requirements.
    b. Allow for the possibility that the consultant team will request revisions and resubmittal following the initial submittal.
    c. The schedule shall encompass the entire construction period and will be revised by the Contractor and reviewed by the project team at each project meeting.
4. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.
    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 Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
5. Administration: Review of Submittals Schedules by Architect, Owner Representative, and District will be to ascertain the general status of submittals review and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.
    a. Submit one copy each to Owner Representative and Architect.
    b. Submit initial Submittals Schedule within 14 days of construction start date established in Notice to Proceed.
    c. After review, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.

I. Indicate delivery dates for owner-furnished products.

J. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
    1. Include Submittals Schedule.

K. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:

1. Preceding and following event numbers.
2. Activity description.
3. Estimated duration of activity, in maximum 15 day intervals.
4. Project Milestones; include “Project Start” and “End Project” Millstones.
    a. Schedule starts no earlier than the Project Duration (Day 1) will start on the Notice To Proceed (NTP) date.
5. Earliest start date.
6. Earliest finish date.
7. Actual start date.
    a. "Project Start” Milestone to have no predecessors and “End Project” Milestone has no successors.
    b. "Project Start”: Constrained by a “Mandatory Start” Milestone.
    c. "End Project”: Constrained by a “Mandatory Finish” Milestone.
    d. No other activities on the schedule may have constraints, unless reviewed and approved by Owner Representative and Architect.
8. Actual finish date.
9. Latest start date.
10. Latest finish date.
11. Total and free float; float time shall accrue to District and to District's benefit.
    a. Contractor does not own the float.
    b. “Float time” refers to the time between earliest finish date and the latest finish date of each activity shown on the Construction Schedule.
    c. Any float time indicated in the Construction Schedules required by this Section are to be held jointly by the District and Contractor.
    d. Any delay (including District caused) encountered is to be subtracted from the available days ahead of progress against the Construction Schedule.
        1) District may claim float days equal to the delay until such float days are exhausted.
        2) No compensation of any type will be due the Contractor until the delay extends the overall project Final Inspection date.
    e. Weather (Rain) day requirements are as specified in the “Construction Services Agreement.”
12. Monetary value of activity, keyed to Schedule of Values.

13. Percentage of activity completed.
14. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By amount of float, then in order of early start.
3. Contractor's periodic payment request sorted by Schedule of Values listings.
4. Listing of activities on the critical path.

3.05 CREW SCHEDULES

A. Separate and concurrent with the Baseline Schedule, submit a schedule histogram depicting crew loading for Contractor's own labor forces and those of each subcontractor. Submit this crew schedule electronically.

B. Provide the breakdown of a typical crew, by trade, for resource loading quantification.

3.06 WEATHER DAYS ALLOWANCE- AS ANTICIPATED BY THE CONTRACTOR

A. Based on historical weather in the local area, the Baseline Schedule shall include all non-work days on which the Contractor anticipates Work will not be performed due to adverse weather days that are anticipated to occur within the work day calendar and impact critical activities.

B. The Contractor shall not receive any additional compensation for unavoidable delays due to inclement or unsuitable weather, and no time extension to complete any Contractual Completion Events as defined in General Conditions, will be considered due to inclement or unsuitable weather or conditions resulting there from.

3.07 REVIEW AND EVALUATION OF SCHEDULE

A. Review all schedules reviewed and approved by Contractor prior to submission for review by Architect and District.

B. Participate in joint review and evaluation of schedule with Construction Manager and Architect at each submittal.

C. Evaluate project status to determine work behind schedule and work ahead of schedule.

D. After review, revise as necessary as result of review, and resubmit within 10 days.

E. Review by Architect and District 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.

3.08 SUMMARY SCHEDULE

A. Provide Summary Schedule, upon request, which consolidates groups of activities associated with Major Items of Work shown on Baseline Schedule.
1. Summary Schedule is intended to give an overall indication of the project schedule without a large amount of detail.

2. This schedule shall include the current status of each of the contract Milestones listed in the Agreement, and any significant activities that are critical to the completion of the Milestone work at the required time.

B. Include in the Summary Schedule a separate Gantt Chart depicting only the critical path of the project at the time of the update.

C. Updated and submitted monthly and with each Schedule Update or Schedule Revision.

3.09 WEEKLY (SHORT TERM LOOK-AHEAD) SCHEDULE

A. Submit to Owner Representative, twenty four (24) hours prior to each weekly progress meeting, a short term look ahead schedule showing the activities completed during the previous week and the schedule of activities for the following 4 weeks.

B. Using the same computer software as the progress schedule, use the Activity ID's, Descriptions, and logic of the current progress schedule when producing a Weekly Schedule in CPM schedule or a bar chart format.

1. In the event that the Weekly Schedule no longer conforms to the current schedule, Contractor may be required to revise either or both schedule(s).

C. The activity designations used in the Weekly Schedule must be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.

D. Contractor and Owner Representative must agree on the format of the Weekly Schedule.

E. Weekly Schedule should indicate locations of work, critical activities, early start and early finish dates, actual start and actual finish dates, progress, and remaining durations for each activity in the three-week schedule.

3.10 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.11 ADJUSTMENT OF CONTRACT TIMES

A. Subject to the terms of General Conditions, contract time will be adjusted only for causes specified as generally described below.

1. Non-excusable delay:

a. Includes actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility that would independently delay the completion of the Work beyond the current Contract completion date.

1) This also includes actions or inactions of subcontractors, suppliers, or material manufacturers at any tier.

b. No time extensions will be granted for non-excusable delays.

2. Excusable delay:

a. Events which are unforeseeable, outside the control of, and without the fault or negligence of either the District or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date.

b. The Contractor is entitled to a time extension only.

c. No other damages will be approved.

3. Compensable delay:

a. Actions or inactions of the District, or events for which the District has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date.

b. The Contractor is entitled to a time extension and delay damages.

4. Concurrent delay:

a. Any combination of the above three (3) types of delay occurring on the same calendar date, or cases where the combination consists of two (2) or more instances of the same type of delay occurring on the same calendar date.

1) Exception to concurrent delay:

(a) When one cause of delay is District-caused or caused by an event which is beyond the control and without the fault or negligence of either the District or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.

B. If the Contractor believes that the District has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path.

1. Proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.

C. Notify Owner Representative of a potential request for Contract Time adjustment within five (5) days of the start of the impact.

D. The Contractor shall prepare and submit along with any Change Order Request (COR), response to Request for Proposal/Quote (RFP/RFQ), Differing Site Condition (DSC) notification or Request for Additional Compensation (RAC) a Time Impact Analysis (TIA) which includes both a written narrative and a schedule diagram depicting how the changed work may affect the progress of work and other schedule activities.

1. The schedule diagram shall show how the Contractor proposes to incorporate the changed work in the schedule, and how it impacts the current updated schedule and critical path.
2. The TIA shall not be resource constrained, or leveled using resource limits.
3. Failure to include a TIA with the COR, Proposal, Quote, DSC or RAC shall constitute a waiver of the right to later claim any adjustment in time based upon changed or unforeseen Work.

E. Time Impact Analysis (TIA):
1. Use the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other District-caused delay). Represent the delay event in the schedule by:
    a. Inserting new activities associated with the delay event into the schedule.
    b. Revising activity logic.
    c. Revising activity durations.
2. If the project schedule's critical path and milestone date(s) are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact without resource constraints may be warranted.
3. The Time Impact Analysis submittal must include the following information:
    a. A fragment of the portion of the schedule affected by the delay event.
    b. A narrative explanation of the delay issue and how it impacted the schedule.
    c. A digital file containing the schedule file used to perform the Time Impact Analysis.

F. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension and no compensation for extended overhead.

G. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date.
1. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.

H. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the Contract completion date.
1. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.

I. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the Contract Time.

J. Submit request as specified with Contract Documents.

1. In cases where the Contractor does not submit a request for Contract Time adjustment for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

K. The Owner Representative will, within five (5) working days after receipt of a Contract Time adjustment, request any supporting evidence, review the facts, and advise the Contractor in writing.

1. Include the new Progress Schedule data, if accepted by the District, in the next monthly Schedule Update.

2. When the District has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect that amount of time adjustment in the Progress Schedule as the Owner Representative may accept as appropriate for such interim purpose.

a. It is understood and agreed that any such interim acceptance by the Owner Representative shall not be binding.

b. Interim acceptance shall be made only for the purpose of continuing to schedule the Work

c. Interim acceptance shall remain until such time as a final determination as to any adjustment of the Contract Time acceptable to the Owner Representative has been made.

d. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

3.12 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Construction Manager, Architect, District, and other concerned parties.

B. Posting: Post one copy, minimum, of most recent Construction and Submittals Schedules in the Contractor's jobsite office, readily available to Owner Representative and Architect.

C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

D. Archive: Preserve a minimum of two copies of all superseded schedules, with a minimum of one copy available at job office for review by Owner Representative or Architect.

3.13 FINAL SCHEDULE SUBMITTAL

A. The final Schedule Update becomes the Record (As-Built) Schedule.

1. The As-Built Schedule reflects the exact manner in which the project was constructed by reflecting actual logic, start and completion dates for all activities accomplished on the project.

2. Contractor's Project Manager and Scheduler sign and certify the Record (As-Built) Schedule as being an accurate record of the way the project was actually constructed.

B. Retainage will not be released until final Schedule Update is provided.

END OF SECTION

SECTION 01 35 50
REQUESTS FOR ELECTRONIC FILES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements to request electronic construction document files from Architect.

B. Hold Harmless Agreement form.

1.02 RELATED SECTIONS

A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples.

B. Section 01 70 00 - Execution and Closeout Requirements.

C. Divisions 31 through 33 - Site Work.

1.03 REQUIREMENTS

A. Electronic files have legal ramifications as information therein can be modified.

B. In order to receive this electronic information, the following Hold Harmless Agreement form must be executed in its entirety, including signature by a company officer.

C. Costs for processing and handling electronic files, however limited, will be $600.00

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION.)

PART 3 - EXECUTION

3.01 ELECTRONIC FILE TRANSFER PROCEDURE

A. Submit a check in the amount of $600.00 per delivery request along with a list of the requested sheet numbers and an acknowledged copy of this waiver to the office of the Architect, tBP/Architecture, 4611 Teller Avenue, Newport Beach, CA 92660.

B. In order to expedite the transfer, upon receipt of a PDF copy of this acknowledgement, the requested CAD/Revit/BIM files will be sent in the form of a compact disc, DVD, or thumb drive to the recipient, as requested, by UPS, similar delivery service, or other method of electronic transfer after payment is received.

C. It is expressly understood that any transfer is done as a courtesy and can be revoked at any time by the Architect.

Agreement is on next page

HOLD HARMLESS AGREEMENT

ARCHITECT'S PROJECT: ADMINISTRATION BUILDING RENOVATION DIBBLE ADULT SCHOOL

ARCHITECT'S PROJECT NUMBER: 21206.00

We, _____, understand that we may be receiving electronic media containing design information, not necessarily intended for construction. We agree to hold tBP/Architecture harmless for any defects in this data. We agree that it shall be our responsibility to reconcile this electronic data with the paper plans, and that only the paper plans shall be regarded as legal documents for the referenced project.

Further, the Contractor acknowledges that the Architect's reports, drawings, specifications, field data, field notes, laboratory test data, calculations, estimates and other similar documents are instruments of professional service, not products. In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professionals, the Parties listed above covenant and agree that all such drawings and data are instruments of service of the Design Professionals, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Parties agree that in accepting and utilizing any drawings and other data, that the Design Professionals waive all responsibility for any subsequent use of these data, the accuracy of dimensions, and the interpretation of information contained herein.

The Parties further agree not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Parties further agree to waive all claims against the Design Professionals resulting in any way from any unauthorized changes of the drawings and data or any other use other than for the project which is the subject of this Agreement.

The Contractor shall indemnify, defend and hold harmless the Design Professionals and its subconsultants and their officers, agents, employees from any claims, damages, losses, liabilities or expenses (including attorneys' fees) arising out of use of such documents without Consultant's prior written authorization.

Under no circumstances shall transfer of the drawings and other data be deemed a sale by the Design Professionals, and the Design Professionals make no warranties, either express or implied of the merchantability and fitness of the data for any particular purpose.

Sheet numbers or discipline requested: _____

_____

Acknowledged by: Company Name _____

_____ _____ _____

Signature of Company Officer Print or Type Name Date

Street Address _____

City, State, Zip Code _____

E-mail Address _____

END OF SECTION

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: use of premises and occupancy.

B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

A. Protect Work , existing premises and District's operations from theft, vandalism, and unauthorized entry.

B. Initiate program in coordination with District's existing security system at project mobilization.

C. Maintain program throughout construction period until District acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to District on request.

D. District will control entrance of persons and vehicles related to District's operations.

E. Contractor shall control entrance of persons and vehicles related to District's operations.

F. Coordinate access of District's personnel to site in coordination with District's security forces.

1.05 PERSONNEL IDENTIFICATION

A. Shall be worn by Contractor’s superintendent and all sub contractors

B. Provide identification badge to each person authorized to enter premises.

C. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.

D. Maintain a list of accredited persons, submit copy to District on request.

E. Special badges shall be issued to construction personnel when term of construction exceeds six months.

F. Require return of badges at expiration of their employment on the Work.

1.06 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of District.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

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. References and standards.

D. Inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. 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 45 33 - Code-Required Special Inspections and Procedures: Testing laboratory services and inspections required by Division of the State Architect (DSA), during the course of construction.

D. 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. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.

H. 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 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1. Structural Design of Formwork: As described in Section 03 10 00 - Concrete Forming and Accessories.
2. Concrete Mix Design: As described in Section 03 30 00 - Cast-in-Place Concrete. No specific designer qualifications are required.

1.07 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, Project Inspector, 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.

1.08 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.

1.09 REFERENCES AND STANDARDS

1.10 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 and Procedures.

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.

1.11 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 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. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, and DSA.
2. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
3. Laboratory: Authorized to operate in California.
4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
5. 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 facilitate tests/inspections.
    c. To provide for 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. Costs of re-testing required because of non-compliance with specified requirements are to be reimbursed to the District by the Contractor through a deductive change order, CAC 4-335(b).

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 - 2022 California Administrative Code.
2. Part 2, Title 24 CCR - 2022 California Building Code (CBC); Volumes 1 and 2.
    a. Based on ICC (IBC) - ICC International Building Code, 2021.

b. Effective dates of referenced standards are according to Chapter 35.

3. Part 3, Title 24 CCR - 2022 California Electrical Code.
4. Part 4, Title 24 CCR - 2022 California Mechanical Code (CMC).
5. Part 5, Title 24 CCR - 2022 California Plumbing Code (CPC).
6. Part 6, Title 24 CCR - 2022 California Energy Code.
7. Part 9, Title 24 CCR - 2022 California Fire Code (CFC).
8. Part 10, Title 24 CCR - 2022 California Existing Buildings Code.
9. Part 11, Title 24 CCR - 2022 California Green Building Standards Code (CalGreen).
   a. California Green Building Standards Code, Title 24, Part 11 (CALGreen) Section 5.409 Life Cycle Assessment.
      1) GWP Analysis report and Worksheet WS-4.
      2) Table 5.409.3 Product GWP Limits
10. Part 12, Title 24 CCR - 2022 California Referenced Standards Code.
11. Title 19 CCR, Public Safety

F. Erosion and Sedimentation Control Regulations:
   1. California Codes and Regulations; Title 24, California Building Code, Parts 1 & 2.
   2. State of California State Water Resources Control Board Regulations.
   3. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.

G. Maintain on site during construction, a copy of California Codes and Regulations; Title 24, California Building Code, Parts 1 through 5.

1.02 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:
   1. For a list of applicable standards, including California amendments to the NFPA Standards, refer to CBC Chapter 35 and CFC Chapter 80.

B. California Referenced Standards Code: 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 - 2022 CBC (SFM) Chapter 35.
   2. NFPA 13 - Standard for the Installation of Sprinkler Systems (CA Amended); 2022, as amended in 2022 CBC Ch. 35 Referenced Standards.
   3. NFPA 17A - Standard for Wet Chemical Extinguishing Systems; 2021, as indicated in 2022 CBC Ch. 35 Referenced Standards.
   4. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2019, as amended in 2022 CBC Ch. 35 Referenced Standards.
   5. NFPA 72 - National Fire Alarm and Signaling Code (CA Amended); 2022, as amended in 2022 CBC Ch.35 Referenced Standards.

6. 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 - 2010 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.

B. Reference standards full title and edition date.

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 Final Inspection.

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 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

2.02 ASTM E SERIES -- ASTM INTERNATIONAL

A. ASTM E2072 - Standard Specification for Photoluminescent (Phosphorescent) Safety Markings.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

2.03 CAL -- STATE OF CALIFORNIA

A. CAL TITLE 24 P6 - California Code of Regulations, Title 24, Part 6 (California Energy Code).

B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

C. CAL (OSHA) TITLE 8 SC 7 - California Code of Regulations, Title 8, Subchapter 7, General Industry Safety Orders.

D. CEC-500-2013-045 - Advanced Automated HVAC Fault Detection and Diagnostics Commercialization Program.

2.04 CARB -- CALIFORNIA AIR RESOURCES BOARD

A. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.

B. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

2.05 CALIFORNIA DEPARTMENT OF GENERAL SERVICES, DIVISION OF THE STATE ARCHITECT

A. Interpretation of Regulations

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

2.06 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

2.07 UL -- UNDERWRITERS LABORATORIES INC.

A. UL 1994 - Luminous Egress Path Marking Systems.

2.08 WCMA -- WINDOW COVERING MANUFACTURERS ASSOCIATION

A. WCMA A100.1 - Standard for Safety of Window Covering Products.

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.01 CFR -- CODE OF FEDERAL REGULATIONS

A. ADA Standards - 2010 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.

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 Structural 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 AND PROCEDURES

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. Fabricators' field services.

1.02 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.

C. NIST: National Institute of Standards and Technology.

D. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.

1. Special inspections and tests are separate from and independent of tests and inspections conducted by District or Contractor for purposes of quality assurance and contract administration.

1.03 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

B. DSA IR 17-12 - Special Inspection Reporting Requirements.

C. DSA PR 13-01 - Construction Oversight Process.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Special Inspection Agency Qualifications: Prior to start of work, 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 start of work, Testing Agency is required to:
   1. 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: When required by AHJ, submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.

E. Fabricator's Qualification Statement: When required by AHJ, submit documentation of fabrication facilities and methods and quality control procedures. Include documentation of AHJ approval.

F. Comply with DSA IR 17-12.
   1. DSA Form 291: From the engineering manager of the laboratory of record.

G. Special Inspection Reports: After each special inspection, Special Inspector is required to submit at least two copies of report; Two to Architect; one each to Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor
   1. Include:
      a. File Number and Application Number assigned to this project by the DSA.
      b. Date issued.
      c. Project title and number.
      d. Name of Special Inspector.
      e. Date and time of special inspection.
      f. Identification of product and specifications section.
      g. Location in the Project.
      h. Type of special inspection.
      i. Date of special inspection.
      j. Results of special inspection.
      k. Compliance with contract documents.
   2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

H. Fabricator Special Inspection Reports: After each special inspection of fabricated items at fabricator's facility, Special Inspector is required to submit report to Architect, Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor

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 standards.

I. Test Reports: After each test or inspection, Testing Agency is required to submit report to Architect, Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor

1. Test Reports: Signed by a Civil Engineer licensed in the State of California.
2. 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. Include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
        1) Report samples taken but not tested.
        2) Report of special sampling operations as required.
        3) Show that the material or materials were sampled and tested in accordance with the requirements of the CBC, and with the approved specifications.
        4) Definitely state whether or not the material or materials tested comply with requirements.

5) Issue test reports within 14 days of finding being known, to all parties listed above.

J. Certificates: When required by AHJ, Special Inspector will submit certification by manufacturer, fabricator, and installation subcontractor to Architect, Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor.

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.
3. At the completion of the project, Testing Laboratory to 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.

K. Fabricator's Inspection Reports: When required by AHJ, submit reports to Architect and AHJ.

1. Submit report in duplicate within 30 days of observation to Architect for information.

L. Verification of Test Reports:

1. Testing Laboratory of record to 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.
   a. 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.
   b. 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:
      1) DSA-201: Soils Compaction.
      2) DSA-202: Sieve Analysis.
      3) DSA-203: Tension/Bend.
      4) DSA-204: Compression.
      5) DSA-250: Special Inspection(s).
      6) DSA-291: Laboratory Verified Report.
      7) DSA-292: Special Inspection(s) Verified Report(s).
      8) DSA-293: Geotechnical Verified Report.
   c. Other Division of the State Architect (DSA) Certification Documents (Reports) as may be required.
2. DSA Form 292 - Special Inspection Verified Report shall be from all special inspectors contracting directly and individually with the school board.

1.05 SPECIAL INSPECTION AND TESTING AGENCY

A. District is to employ services of Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by building code.

B. Special Inspection Agency may delegate to independent testing agency to perform testing and sampling associated with special inspections and required by building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.

1.06 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. District Project Inspector:

1. 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.
    a. Project Inspector duties are specifically defined in Title 24 CCR Part 1, California Administrative Code Section 4-342.
2. The District's Inspector must 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 is required to at all times maintain proper facilities and provide safe access for such inspection.
3. The work of construction in all stages of progress shall be subject to the personal continuous observation of the District's Inspector.
    a. The Contractor is required to furnish the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials.
    b. Inspection of the work does not relieve the Contractor from any obligation to fulfill the Contract.
    c. If determined by DSA, Project Inspector is required to work a normal 40 hour week on this project only. Any overtime required will be included in a deductive change order to the Contractor and sub-contractor requiring the inspection.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.

D. Payments:

1. 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.
2. Testing Laboratory: 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.

3. 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.
4. 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.
    a. Costs for tests or inspections which are required to correct deficiencies will be paid by the District and backcharged to the Contractor.
    b. 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.
    c. 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.
    d. 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.
5. Testing Laboratory: Separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the Contractor as specified above.

1.07 QUALITY ASSURANCE

A. Testing Agency must possess DSA LEA Program acceptance.

B. Special Inspection Agency Qualifications:
    1. Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Testing Agency Qualifications:
    1. Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Testing and inspection services which are performed are to be in accordance with requirements of the CBC, and as specified herein. Testing and inspection services are required to verify that work meets the requirements of the Construction Documents.

E. In general, tests and inspections for structural materials are to include all items enumerated on the Structural Tests and Inspections list for this project as prepared and distributed by the Architect.

F. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document. Online copies are acceptable.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS AND TESTING

A. The Code requires special inspections and testing of certain materials, components, assemblies, and connections used in constructing the project. Special inspections and testing will be performed in accordance with the Code.

B. Tests and inspections are required in accordance with DSA 103 Form.

C. Special inspections and testing will be performed in accordance with the Code for the following materials and project components:

1. Steel.
2. Concrete.
3. Soils.
4. Cast-in-place deep foundations.
5. Fabricated items.
6. Wind resistance.

3.02 INSPECTION BY HEALTH DEPARTMENT:

A. CONSTRUCTION INSPECTIONS: Contact the Health Department Plan Checker for a Preliminary Inspection when construction is approximately 80% complete, with plumbing, rough ventilation, and rough equipment installed. Request for inspection should be made at least five (5) working days in advance.

B. A FINAL INSPECTION MUST be made upon completion of ALL work including finished details. APPROVAL to operate shall not be granted, or remodeled areas approved to operate, until the facility has passed the FINAL INSPECTION, and “APPLICATION TO OPERATE” has been completed and PERMIT FEES have been paid.

3.03 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:

1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified reference standards.
3. Ascertain compliance of materials and products with requirements of Contract Documents.
4. Promptly notify Architect, Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.

6. Attend preconstruction meetings and progress meetings.
7. Submit reports of all tests or inspections specified.
8. Complete required DSA Forms.

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. CAC 4-335 (b).

3.04 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Attend preconstruction meetings and progress meetings.
7. Submit reports of all tests or inspections specified.
8. Complete required DSA Forms.

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. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

E. 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 Division of the State Architect Procedure DSA PR 13-01.

3.05 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Each Multi-Prime Contractor or Subcontractor is required to comply with DSA Construction Oversight Procedure DSA 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).

B. Contractor Responsibilities, General:

1. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
2. 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.
3. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
4. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
5. Retain special inspection records.

C. 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 are required to submit a written statement of responsibility to the Division of the State Architect and the District prior to the commencement of work on the system or component. The "Statement of Responsibility" contains 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, 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.

3.06 FABRICATORS' FIELD SERVICES

A. When required by AHJ or specified in individual specification sections, require fabricators to provide qualified staff personnel to observe site conditions, installation conditions, quality of workmanship, and start-up of equiment and systems 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.

1.02 RELATED REQUIREMENTS

A. Section 01 35 53 - Security Procedures

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

C. Section 01 58 13 - Temporary Project Signage.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.04 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. 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 and duration of the project.

B. Telecommunications services shall include:

1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
    a. Provide color copier with scanning capabilities and 8.5 x 11 and 11x17 format; including copier paper for both formats.
2. Telephone Land Lines: Multiple lines, minimum; one handset per line.
3. Internet Connections: Minimum of one for each desk; Cable modem (2GB) or faster.
    a. Provide hi-speed INTERNET service in the District Construction Manager and Inspector field office for FOUR personnel; including copier/scanner.

4. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.

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 Owner Representative 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: Commercial grade chain link fence. Include windscreen with galvanized steel schedule 40 post and top rail.

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. Include construction surveillance camera system per the District.

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 Owner Representative 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 SIGNS - SEE SECTION 01 58 13

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 Final Application for Payment 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 Owner Representative.

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. Section 01 91 13 - General Commissioning Requirements: Verification of installed Work and it's performance.

E. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): HVAC filters.

F. 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.

G. 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 Version 1.2.

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. Preliminary tests of instruments and apparatus and of test spaces.
2. Calculations of ventilation effectiveness, variable "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. Volatile Organic Compounds 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 parts per billion.
3. Comply with CalGreen Building Standards Section 5.504, Table 504.4.3 "VOC Content Limits for Architectural Coatings".
4. Comply with CalGreen Building Standards Section 5.504, Table 504.4.1 "Adhesive VOC Limit" and Table 504.4.2 "Sealant VOC Limit".
5. Total Volatile Organic Compounds (TVOCs): Not more than 200 micrograms per cubic meter.
6. Chemicals Listed in CAL (CDPH SM) Table 4-1, other than Formaldehyde: Not more than allowable concentrations listed in Table 4-1.
7. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.
8. 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-6A.
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 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.
   1. System Completeness.
   2. Installation of Products.
B. Re-use of existing products.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations.
F. Procedures for District-supplied products.
G. 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. Technical Specifications Sections.

1.03 REFERENCE STANDARDS

A. ASTM D6866 - Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis.
B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
C. EN 15804 - Sustainability of Construction Works - Environmental Product Declarations - Core Rules for the Product Category of Construction Products.
D. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
E. ISO 14040 - Environmental Management - Life Cycle Assessment - Principles and Framework.
F. ISO 14044 - Environmental Management - Life Cycle Assessment - Requirements and Guidelines.

G. ISO 21930 - Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.

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 30 calendar 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.

E. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.

1.05 QUALITY ASSURANCE

1. Determine percentage of bio-based content in accordance with ASTM D6866.
2. Bio-based content must be sourced from a Sustainable Agriculture Network certified farm.

B. 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.

1. Good: Product-specific; compliant with ISO 14044.
2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
5. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.

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 "or Equal" product other than the item indicated, whether or not listed in these specifications, Contractor must submit the product using the complete substitution process**, prior to bid**. 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.

H. Mechanical and Plumbing: Comply with requirements specified in Divisions 22 and 23, as included in this Project Manual and in the Drawings.

I. Electrical, Communications, and Electronic Safety and Security: Comply with requirements specified in Divisions 26, 27, and 28, as included in this Project Manual and in the Drawings.

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 regarding construction interfacing and coordination.

2.03 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the District; notify District promptly upon discovery; protect, remove, handle, and store as directed by District.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the District, or otherwise indicated as to remain the property of the District, become the property of the Contractor; remove from site.

2.04 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 by the same manufacturer 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, 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.

2.05 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, prior to bid .

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, prior to bid, 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 may 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.

2.06 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.

1. Execute a formal supplemental agreement between District and Contractor allowing off-site storage, for each occurrence.

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 Completion review. Refer to additional requirements specified in General Conditions along with Section 01 50 00 - Temporary Facilities and Controls and Section 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 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. Composite wood.
5. Products making up wall and ceiling assemblies.
6. Thermal and acoustical insulation.
7. 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 Version 1.2.

D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.

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 - Standard for 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.

E.

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.scscertified.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 jursidiction, South Coast Air Quality Management District, and Caifornia 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

FORM

1.01 IDENTIFICATION:

A. Project Name: Administration Building Renovation Dibble Adult School

B. Project No.: 21206.00

C. Architect: tBP/Architecture

1.02 USE OF THIS FORM:

A. 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.

1. 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.

B. Contractor is required to obtain and submit this form from each installer of work on this project.

C. For each product category listed, check the correct paragraph.

D. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

1.03 VOC CONTENT RESTRICTIONS ARE SPECIFIED IN SECTION 01 61 16.

A. 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.

2.01 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.

3.01 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. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures.

B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

C. Section 01 45 33 - Code-Required Special Inspections and Procedures: Construction oversight procedures by Division of the State Architect regarding the execution, approval, and closeout of this building project.

D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

H. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

I. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

J. Section 07 84 00 - Firestopping.

K. 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. CBC Chapter 11B - California Building Code-Chapter 11B.

B. CBC Chapter 33 - Safeguards During Construction.

C. CFC Chapter 33 - California Fire Code - Chapter 33 - Fire Safety during Construction and Demolition.

D. CFC Chapter 35 - California Fire Code - Chapter 35 - Welding and other Hot Work.

E. DSA BU 24-05 - Fire Safety During Construction and Demolition.

F. 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.
    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. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

B. 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.

C. 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, pneumatic hammers, and air-operated nail guns.
   2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

E. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

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 site 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.

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.

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 electronic copies to Architect, District, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. 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.

H. 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.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Dimensions for Accessibility:

1. Conventions: See CBC Chapter 11B Figure 11B-104. Dimensions that are not stated as "maximum" or "minimum" are absolute.
2. Tolerances shall be per CBC Chapter 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 CBC Chapter 33, CFC Chapter 33, CFC Chapter 35, and NFPA 241, including applicable recommendations in Appendix A.

1. When welding or doing other hot work, comply with CFC Chapter 35.
2. Provide a Site Fire Safety Plan in coordination with the local fire authority. Comply with DSA BU 24-05.
    a. A Site Fire Safety Plan and form DSA 102-IC: Construction Start Notice/Inspection Card Request for submittal through the Architect to the Division of the State Architect.
    b. At a minimum, the site fire safety plan shall include the following information required in CFC Section 3303.1.1.
        1) Name and contact information of site safety director.
        2) Documentation of training of the site safety director and fire watch personnel.
        3) Procedures for reporting emergencies.
        4) Fire department vehicle access routes.
        5) Locations of fire protection equipment, including portable fire extinguishers, standpipes, fire department connections and fire hydrants.
        6) Smoking and cooking policies, designated area to be used where approved, and signage locations in accordance with CFC Section 3305.8.
        7) Location and safety considerations for temporary heating equipment.

8) Hot work (welding, roofing, etc.) plan.

9) Plans for control of combustible waste.

10) Locations and methods for storage and use of flammable and combustible liquids and other hazardous materials.

11) Provisions for site security.

12) Changes that affect this plan.

13) Other site specific information requested by the local fire authority (LFA).

C. 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.

D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. 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.

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.

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.

E. Services (Including but not limited to 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.

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.

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:

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 air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
L. Fit work neat and tight allowing for expansion and contraction.
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 weekly 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. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. 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.

H. Prohibit traffic from landscaped areas.

I. 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. 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.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. 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.

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

3.11 COMMISSIONING PROJECT

A. Project Completion

1. Prior to notifying the Architect that the project is complete according to the construction and contract documents, submit to the Architect:
    a. Approved pre-functional checklists and functional performance testing reports from the commissioning documentation.

B. Final Acceptance
1. Prior to requesting inspection for verification of completion of all outstanding items, submit to the Architect:
    a. The commissioning requirements of Section 01 91 13 - General Commissioning Requirements must be complete prior to final acceptance, unless approved in writing by the District. Exceptions to this are any required seasonal or approved deferred testing.

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.

3.14 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
1. Clean areas to be occupied by District prior to final completion before District occupancy.

B. 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 Owner Representative 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 Owner Representative review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or Owner Representative.

C. 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.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.15 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 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. Procedures required prior to inspection for Completion and for final inspection for acceptance.

c. Submittal of written warranties.

d. Coordination of separate contracts.

e. Installation of District's furniture, fixtures, and equipment.

f. 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.

3.16 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and District.

B. Accompany District, Architect, and Owner 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 / 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 Final Inspection review.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. 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 Final Inspection/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.

E. Clearing and Cleaning: Prior to the Final Inspection review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.

F. Inspection and Testing: Prior to the Final Inspection 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.

G. District will occupy all of the building as specified in Section 01 10 00.

H. Conduct Final 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. Include all items to be completed or corrected prior to the Contractor's application for final payment.

b. 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. 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 DSA, 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 Final Inspection review.

2. Final Inspection 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.

a. Contractor shall provide three working days notice to Architect for requested date of Final Inspection meeting.

b. The Owner Representative, the Architect with Architect's / District's consultants, as authorized by the District, will attend the Final Inspection 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 Owner Representative, 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. Retype the punch list and distribute it within three working days to those attending the meeting.

g. If additional site visits by the Owner Representative, 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.

I. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.

J. Notify Architect when work is considered finally complete and ready for Architect's Final Inspection.

1. Architect's Certification of 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.

K. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.17 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.

3.18 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 Project 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 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 65 percent 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. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
      a. Comply with California Green Code (CGC) 5.408.3; Excavated soil and land clearing debris: 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.
         1) Exception: Reuse, either on-or off-site, of vegetation or soil contaminated by disease or pest infestation.
   6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
   8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
   9. Asphalt paving: May be recycled into paving for project.
   10. 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.
   11. Glass.

12. Gypsum drywall and plaster.
13. 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.
14. Roofing.
15. Paint.
16. Plastic sheeting.
17. Rigid foam insulation.
18. Windows, doors, and door hardware.
19. Plumbing fixtures.
20. Mechanical and electrical equipment.
21. Fluorescent lamps (light bulbs).
22. Acoustical ceiling tile and panels.
23. 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 Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required 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.dgs.ca.gov/BSC/CALGreen.

2. General information contacts regarding construction and demolition waste:
    a. Directory of Wood-Framed Building Deconstruction and Reused Building Materials Companies: www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr150.pdf.
    b. 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.
        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.
4. Recycling Economics Information: The above lists contain information that may be useful in estimating the costs or savings or recycling options.

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 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: List of items to be salvaged from the existing building for relocation in project or for District.

B. Section 01 25 00 - Substitution Procedures.

C. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

D. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

E. Section 01 60 00 - Product Requirements: Waste prevention requirements related to product substitutions.

F. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

G. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

H. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.03 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.

1.04 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 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. Base conversion rate numbers 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, www.calrecycle.ca.gov/LGCentral/Library/Guidance.

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 and Section 01 25 00.

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.						
				Total Quantities		
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	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)
   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

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.						
				Total Quantities		
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	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 - 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 Gravimetric Determination of Water Vapor Transmission Rate 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 Final Inspection. 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. District issued Bidding Instructions and Contract 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 and Procedures: 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. Section 01 78 39 - Project Record Documents: Detailed requirements.

F. Individual Product Sections: Specific requirements for operation and maintenance data.

G. 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. 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 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 to 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 final progress markup PDF documents by uploading via Bluebeam 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 Final Inspection, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Final Inspection, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. See also Section 01 78 39 - Project Record Documents.

B. Record Documents are to be maintained and submitted in searchable live electronic format (PDF), unflattened.

1. Develop in compliance with Section 01 30 00 - Administrative Requirements.

2. Acceptable markup software:

a. Adobe Acrobat Professional.

b. Bluebeam Revu.

C. 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.

D. Ensure entries are complete and accurate, enabling future reference by District.

E. Store record documents separate from documents used for construction.

F. Record information concurrent with construction progress.

G. 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.

H. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
   1. Reproducible (PDF) set of Contract Drawings will be provided to Contractor by District through Architect or Owner Representative.
   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.
   7. Sketches, clarifications (RFI's), Field Orders, Supplemental Instructions, Construction Change Documents, and Approved Change Orders

I. Submission: Submit by uploading, Record Documents to Architect prior to each Application for Payment.

1. Provide, by email, to the Architect, a download link the Record Documents consisting of an unflattened PDF format with live text and redline mark-ups, not scanned.
2. 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; by label machine.

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.

1. Include HVAC outdoor and exhaust air damper calibration strategy.
    a. Include provisions which ensure that full closure of dampers can be achieved.
2. Include Carbon Dioxide Monitoring Protocol.

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. 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. 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.

C. Provisions for Special Warranties: Refer to Conditions of the Contract for terms of the Contractor's special warranty of workmanship and materials.

D. Specific Warranty and Guarantee Requirements: Specific requirements are included in product Specifications Technical Sections, 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 is 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 are in addition to implied warranties, and do 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.

K. 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 Final Acceptance is determined.

L. 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 Specifications 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.

M. 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.

N. Verify that documents are in proper form, contain full information, and are notarized.

1. Provide all warranties and guarantees with District named as beneficiary.
2. Signatures: By person authorized to sign warranties, guarantees and bonds on behalf of entity providing such warranty, guarantee or bond.
3. Co-Signature: All installer's warranties and bonds shall be co-signed by Contractor. Manufacturer's guarantees will not require co-signature.

O. Co-execute submittals when required.

P. Retain warranties and bonds until time specified for submittal.

Q. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

R. 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.

S. 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.

T. 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.

U. 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 78 00.01
WARRANTY FORM LETTER

FOR CONTRACTOR'S / SUBCONTRACTOR'S / MANUFACTURER'S WARRANTY

CONTRACTOR'S/SUBCONTRACTOR'S/SUPPLIER'S LETTERHEAD

SPECIAL LIMITED PROJECT WARRANTY FOR _____ WORK.

We, the undersigned, do hereby warrant that the portion of the Work described above which we have provided for Administration Building Renovation Dibble Adult School is in accordance with the Contract Documents and that all such Work as installed will fulfill or exceed all minimum warranty requirements. We agree to repair or replace Work installed by us, together with any adjacent Work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or function within a period of (years), commencing (date identified in Certificate of Completion, unless otherwise directed) and terminating (date).

The following terms and conditions apply to this warranty (obtain District 's approval before submission):

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the District , after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the District to have said defective Work repaired or replaced to be made good, and agree to pay to the District upon demand all moneys that the District may expend in making good said defective Work, including all collection costs and reasonable attorney fees.

LOCAL REPRESENTATIVE: FOR WARRANTY MAINTENANCE, REPAIR, OR REPLACEMENT SERVICE, CONTACT:

(Name) _____

(Address) _____

(City) _____ (State) _____ (ZIP) _____

(Phone) _____ / _____

(signed) _____

(Typed Name) _____ (Date) _____

(Title) _____ (Firm) _____

CONTRACTOR:

State License No: _____

(signed) _____

(Date) _____ (Typed Name) _____

(Title) _____ (Firm) _____

FORM LETTER

FOR CONTRACTOR'S / MANUFACTURER'S GUARANTEE

CONTRACTOR'S / MANUFACTURER'S LETTERHEAD

SPECIAL LIMITED PROJECT [__WARRANTY__] [__GUARANTEE__] FOR _____ WORK.

We, the undersigned, do hereby [__warrant__] [__guarantee__] that the portion of the Work described above which [__we have provided__] [__was provided by (Installer or Subcontractor's Name)__] for Administration Building Renovation Dibble Adult School in accordance with the Contract Documents and that all such Work as installed will fulfill or exceed all minimum warranty requirements. We agree to repair or replace Work installed by [__us,__] [__(Installer or Subcontractor's Name)__] together with any adjacent Work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or function within a period of (years), commencing (date indicated in Certificate of Completion, unless otherwise directed) and terminating (date).

The following terms and conditions apply to this [__warranty__] [__guarantee__] (obtain District's approval before submission):

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the District, after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the District to have said defective Work repaired or replaced to be made good, and agree to pay to the District upon demand all moneys that the District may expend in making good said defective Work, including all collection costs and reasonable attorney fees.

LOCAL REPRESENTATIVE: FOR WARRANTY MAINTENANCE, REPAIR, OR REPLACEMENT SERVICE, CONTACT:

(Name) _____

(Address) _____

(City) _____ (State) _____ (ZIP) _____

(Phone) _____ / _____

(signed) _____

(Date) _____ (Typed Name) _____

(Title) _____ (Firm) _____

CONTRACTOR:

State License No: _____

(signed) _____

(Date) _____ (Typed Name) _____

(Title) _____ (Firm) _____

FORM LETTER

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Record Drawings.

B. Record Specifications.

C. Record Product Data.

D. Record Samples.

E. Record Photos and Video.

F. Miscellaneous record submittals.

1.02 RELATED REQUIREMENTS:

A. Section 01 20 00 - Price and Payment Procedures: Schedule of Values.

B. Section 01 30 00 - Administrative Requirements: Project Coordination.

C. Section 01 78 00 - Closeout Submittals: General Closeout.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Recorded actual locations.

PART 2 -PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 RECORD DRAWINGS

A. Record Documents: Maintain one set of marked-up PDF copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique.

c. Record data as soon as possible after obtaining it.

d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Field changes of dimensions from Drawings.
   b. Revisions to details shown on Drawings.
      1) Details not on original Contract Drawings. Application of copies of details produced and provided by Architect during construction will be accepted.
   c. Depths of foundations and footing, measured in relation to finish First Floor datum.
   d. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent ground improvements.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuits.
   g. Actual equipment locations and sizes.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Permanent Room names and Room numbers.
   k. Changes made by Change Order or Construction Change Directive.
   l. Changes made following written orders by District or Owner Representative.
   m. Changes made following Architect's written orders.
   n. Note clarifications from RFI's.
   o. Field records for variable and concealed conditions.
   p. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
      a. Format: DWG, Version, Microsoft Windows operating system.

2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect and Owner Representative for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    a. See Section 01 35 50 - Requests for Electronic Files for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect and Owner Representative for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification:
    a. Project name and number.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect and Owner Representative.
    e. Name of Contractor.

3.02 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications in PART 2 to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and Record Drawings, where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

3.03 RECORD DESIGN AND ENGINEERING DATA

A. Fire Systems:
1. Provide updated SDU files at each:
a. One flash drive placed inside fire panel cabinet.
b. One flash drive turned over to District.
c. One file copy emailed Operations and Facilities Director or District.

3.04 RECORD PRODUCT DATA

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

B. Format: Submit record Product Data as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

3.05 RECORD SAMPLES

A. Immediately before date of Substantial Completion, meet with District or Owner Representative at Project site to determine which Samples maintained during the construction period aer to be transmitted to District or Owner Representative for record purposes.

B. Comply with District or Owner Representative's instructions for packaging, identification, marking, and delivery to District or Owner Representative's Sample storage space. Dispose of other Samples in the manner specified for disposing surplus and waste materials

3.06 RECORD PHOTOS AND VIDEO

A. Photograph all work before covering up, including:
1. All open trenches and manholes shall be photographed.
2. All exposed utilities should be identified in the photos.
3. Show photograph locations and dates on Record Drawings.

B. Interior video recording of all underground sewer and storm drain lines, under the building and outside to and including the on-site or utility connection.

3.07 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1. Field records on excavations and foundations.
2. Field records on underground construction and similar work.
3. Surveys showing locations and elevations of underground lines.
4. Invert elevations of drainage piping.
5. Surveys establishing building lines and levels.
6. Authorized measurements using unit prices or allowances.
7. Records of plant treatment.
8. Ambient and substrate condition tests.
9. Certifications received in lieu of labels on bulk products.
10. Batch mixing and bulk delivery records.
11. Testing and qualification of trade persons.
12. Documented qualification of installation firms.
13. Load and performance testing.
14. Inspections and certifications by governing authorities.
15. Leakage and water-penetration tests.
16. Fire-resistance and flame-spread test results.
17. Final inspection and correction procedures.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

3.08 SUBMISSION

A. Keep Project Record Documents current, as they will be reviewed for completeness by Architect, Engineer, Project Inspector, and Owner Representative; as a condition of certification for each Progress Payment Application.

B. Prior to the date of the Notice of Completion, submit marked Record Documents to Architect and Owner Representative for review, approval and further processing.

3.09 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Review of documents by Architect, Engineer, Project Inspector, or Owner Representative to be in concert with approval of the monthly Application for Payment.

C. Maintenance of Record Documents and Samples:

1. Store record documents and Samples in the field office apart from the Contract Documents used for construction.
2. Do not use project record documents for construction purposes.
3. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.
4. Provide access to project record documents for Architect and Owner Representative reference during normal working hours.

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. Landscape irrigation.
3. Additional systems as requested by District.
4. 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.
5. Additional systems as requested by District.

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; except:

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, District, and Owner 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 a 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, USB Flash drive, and/or cloud access.

2. Label each with session identification and date.

3. Edit training video so that the content is comprehensive and cohesive.

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 Commissioning Authority (CA) shall be responsible for reviewing and approving the content of the training of Owner personnel for commissioned equipment.

C. 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.

D. 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 Final Inspection.
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 Final Inspection.

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 57 23 - Temporary Storm Water Pollution Control.

F. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. 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.

H. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

I. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.

1.03 DEFINITIONS

A. 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.

B. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.

1. 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.

C. 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.

D. 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.

E. 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.

F. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

G. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to District in ready-for-reuse condition.

H. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

I. Reuse: The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.

J. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

K. Waste:

1. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.

2. 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.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

B. CBC Ch. 33 - Safeguards During Construction.

C. CFC Ch. 33 - Fire Safety During Construction and Demolition.

D. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

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 Owner Representative, 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.

1.06 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain property of Hacienda La Puente Unified 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 Owner Representative 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.

B. Storage or sale of removed items or materials on-site will not be permitted without advance written approval from Owner Representative.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:

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 required by OSHA and local AHJs.
1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
2. Demolition firm 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 DEMOLITION

A. Remove paving and curbs required to accomplish new work.

B. Within area of new construction, remove foundation walls and footings to minimum 2 feet below finished grade.

1. Below-Grade Construction: Demolish foundation walls and other below-grade construction:

a. Completely remove below-grade construction, including foundation walls and footings, unless indicated otherwise on Drawings.

b. Break up and completely remove below-grade concrete slabs, in small sizes, suitable for acceptance at recycling or disposal facilities.

c. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations to street level with satisfactory soil materials.

C. Remove other items indicated, for salvage, relocation, and recycling.

D. 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 Owner Representative, Project Inspector and Architect.

D. Comply with requirements 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. Protection of Natural Resources: Preserve the natural resources within the project boundaries or restore to an equivalent condition.
3. Confine demolition activities to areas defined by public roads, easements, and work area limits indicated on the drawings.
4. Temporary Construction: Remove indications of temporary construction facilities, such as haul roads, work areas, structures, stockpiles or waste areas.
5. 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.
6. 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.
7. Noise Control: Perform demolition operations to minimize noise.
    a. Repetitive, high level impact noise will be permitted only during the times indicated in Section 01 70 00 - Execution and Closeout Requirements.

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, CBC Ch. 33, 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 Owner Representative.
        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 permits from authority having jurisdiction.
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. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.

K. Protect existing structures and other elements to remain in place and not 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.

L. 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.

M. Hazardous Materials:
    1. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

N. 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.

O. 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.

P. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

Q. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not disrupt public utilities without permit from authority having jurisdiction.

C. 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.

D. 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.

E. 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.

F. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
    1. Verify 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 areas that remain 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 and in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Remove existing work as indicated and required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
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 to remain in operation, and 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 - Summary for 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, including those above accessible ceilings. 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 as required.
2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove materials not to be reused on site; comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

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 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 05 50 00 - Metal Fabrications: Placement of embedded steel anchors and plates in cast-in-place concrete.

D. Section 32 13 13 - Site Concrete: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

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

B. ACI PRC-347 - Guide to Formwork for Concrete.

C. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials.

D. ACI SPEC-301 - Specifications for Concrete Construction.

E. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

F. PS 1 - Structural Plywood.

G. CBC Chapter 19A.

1.04 DEFINITIONS

A. Unexposed Finish: A general-use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.

B. Exposed Finish: A general-use finish applicable to all formed concrete exposed to view and including surfaces which may receive a paint coating (if any).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on void form materials and installation requirements.

1. Form release agent.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

1.06 QUALITY ASSURANCE

A. Industry Standard: Formwork design and construction shall be in accordance with ACI SPEC-301, ACI CODE-318, and ACI PRC-347.

B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

C. Regulatory Requirements: Conform to formwork construction requirements of the California Building Code (CBC) Title 24, Part 2, Chapter 19A as amended and adopted by authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI CODE-318, ACI PRC-347, and ACI SPEC-301.

F. Provide materials for contact with concrete which impart suitable surface quality to completed concrete. Use the following form types:

1. Forms for Exposed Finish Concrete:
    a. Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces.
    b. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on the Drawings.
2. Forms for Unexposed Finish Concrete:
    a. Plywood, lumber, metal, or another acceptable material.
    b. Provide lumber dressed on at least two edges and one side for tight fit.
    c. When unexposed concrete is intended to receive waterproofing, provide form as for exposed finish concrete.

G. Provide materials to construct formwork to support forming materials in contact with concrete, of sufficient capacity to withstand pressures of concrete placement and to support concrete in place until cured, without distortion.

2.02 WOOD FORM MATERIALS

A. Plywood for Architectural Concrete: Marine Grade, APA B-B Plyform Class 1.
   1. APA proprietary concrete form panels designed for high reuse.
   2. HDO for very smooth concrete finish, in Structural I, and with special overlays.
   3. Bond Classification: Exterior. Common Performance Categories: 19/32, 5/8, 11/16, 23/32, 3/4.

B. Softwood Plywood for Concealed Surfaces: PS 1,undamaged face C Grade, Group 2 Plugged EXT or APA Structural I Sheathing.

C. Hardboard: For curved surfaces, tempered hardboard, Masonite Corp., or equal.

D. Lumber: Douglas fir or douglas fir-larch species; appropriate for intended use grade; with grade stamp clearly visible.
   1. Sound and undamaged straight edges, and solid knots, to maintain principal shores to support concrete until minimum strength is achieved as approved by Structural Engineer.

E. Embedded Nailers: Clear all heart redwood or pressure preservative-treated (PPTDF) douglas fir, edges reverse beveled to key into concrete.

2.03 FORMWORK ACCESSORIES

A. Form Ties: Removable, adjustable-length or snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Do not use materials containing diesel oil or petroleum-based compounds.
   2. Does not impair subsequent treatments of concrete surfaces or bond of applied coatings.
   3. Products:
      a. Kaufman Products Inc; FormKote Emulsion: www.kaufmanproducts.net/#sle.
      b. Nox-Crete Inc; BIO-NOX: www.nox-crete.com/#sle.
      c. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
      d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

C. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
   1. Thickness: 0.125 inch
   2. Compression Resistance, ASTM D695: 5,500-8,000 PSI.
   3. Products:
      a. BoMetals, Inc: www.bometals.com/#sle.
      b. Sika Corporation; Speed Dowel: usa.sika.com

c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 50 00.

F. Screed Pins and Chairs:

1. Provide units that leave no metal closer than 1-1/2 inch to the plane of the exposed concrete surface.

2. Manufacturers:

a. Grann Adjustable Quick Screed (800/554-7266).

b. Dayton Richmond (800/745-3700).

c. Aztek (877/531-3344).

d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 SYSTEM REQUIREMENTS

A. Formwork Design Requirements: Formwork products and execution specified herein are for finish surface quality only.

1. Design, layout and construction of formwork shall be solely the responsibility of the Contractor.

2. Design and construct formwork, shoring and bracing to conform to California Building Code (CBC), Title 24, Part 2, Chapter 19A requirements and ACI CODE-318.

3. Resulting concrete shall conform to shapes, lines and dimensions indicated and required.

B. Coordination:

1. Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses.

2. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from the Architect before proceeding.

3.03 EARTH FORMS

A. Earth (Soil) Forms, General: Except as otherwise indicated on Drawings, conform to ACI SPEC-301, ACI PRC-347, and California Building Code (CBC) requirements. Refer also to notes on Structural Drawings.

B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.04 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301, ACI PRC-347, and California Building Code (CBC) Title 24, Part 2 requirements.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

1. Use form ties of sufficient strength and sufficient quantities to prevent formwork spreading.
2. Maintain principal shores to support concrete until minimum required strength is achieved.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

1. Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work.
2. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

D. Align joints and make watertight. Keep form joints to a minimum. Make forms watertight to prevent leakage of concrete mortar. Locate form joints, at exposed concrete, to be symmetrical about center of panel, unless otherwise noted. Align joints symmetrically at exposed conditions.

E. Permanent openings: Provide openings to accommodate Work specified in other Sections. Size and locate openings accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.

F. Temporary openings: Provide temporary openings for cleaning and inspection. Provide drain openings at bottoms of formwork to allow water to drain. Locate temporary openings in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete Work.

G. Obtain approval before framing openings in structural members that are not indicated on drawings.

H. Coordinate this section with other sections of work that require attachment of components to formwork.

I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

J. Inspection: Before placing of concrete, and after placement of reinforcing steel in the forms, provide notification so that proper inspection can be made. Make such notification at least 2 working days in advance of placing concrete.

K. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified shall be considered just cause for the removal of such forms and, in addition, the concrete construction so affected. Reconstruct forms, place new concrete and required reinforcing steel at no additional cost to the District.

3.05 APPLICATION - FORM RELEASE AGENT

A. Form Release Agent: Provide either form materials with factory applied non-absorptive liner or field applied form coating to comply with applicable air quality regulations for VOC. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is not acceptable.

B. Apply form release agent on formwork in accordance with manufacturer's recommendations.

C. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

D. Do not apply form release agent where concrete surfaces to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

1. Install accessories in accordance with manufacturer's instructions and referenced standards, level, straight and plumb.

B. Locate and set in place items that are cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

1. Openings: Size and locate formed openings, depressions, recesses and chases to accommodate products to be applied to, built into and pass through concrete Work. Coordinate size, location and placement of inserts, embedded products, openings and recesses with Work specified in other Sections.

2. Anchors and Other Devices: Set and build into concrete formwork anchorage devices and other embedded products required for Work to be attached to or supported by concrete elements.

3. Locating Embedded Products and Openings: Use setting drawings, diagrams, instructions and templates to set embedded products.

4. Screeds: Set screeds and establish level for tops of concrete slabs and leveling for finish surfaces. Shape surfaces as indicated on the Drawings. Provide cradle, pad or base type screed supports for concrete over waterproof membranes and vapor retarders.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints are not apparent in exposed concrete surfaces.

3.07 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

1. At above grade forms, flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

C. Formwork Reuse: Do not reuse wood and plywood forming materials which contact concrete, except as follows:
1. High density plywood may be cleaned and reused for exposed concrete.
2. Unfaced plywood may be reused for concealed concrete.
3. Steel and fiberglass forming materials may be cleaned and reused.

D. Patching and Repairs: Patch tie holes with sheet metal patches and restore forms to like new condition prior to reuse.

3.08 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.
1. Also as specified in ACI CODE-318, ACI SPEC-301, and ACI PRC-347, unless otherwise specified or indicated.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
1. Comply with CBC Table 1705A.3, item 14.

C. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.10 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
1. Comply with California Building Code (CBC) requirements.
2. Formwork supporting weight of concrete may not be removed until concrete has reached a minimum of specified 28-day compressive strength and no earlier than 21 days after pour.
3. Removal of Load Bearing Formwork:
a. Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained its 28 day specified compressive strength, unless otherwise specified or permitted by the Structural Engineer of Record.

b. Determine the actual compressive strength has attained is adequate to support the weight of the concrete and superimposed loads.

c. Maintain curing and protection operations after form removal.

4. Removal of Non Load Bearing Formwork After Superimposed Loads or as Approved by Engineer:

a. Provided that concrete has hardened sufficiently, that it is not damaged, and has achieved sufficient strength to support its own weight and all imposed construction and design loads, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours.

b. Maintain curing and protection operations after form removal.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

1. Remove formwork progressively so no unbalanced loads are imposed on structure. Remove formwork without damaging concrete surfaces.

2. Remove or snap off metal spreader ties inside wall surface. Cut nails and form ties off flush and leave surfaces level and clean.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

3.11 PATCHING

A. Schedule: Patch forming and tie holes immediately after form removal.

B. Cleaning: Clean surface of all loose materials and soiling.

C. Patching: Patch all holes and depressions with grouting gun and grout mix of one part cement and 2-1/2 parts mortar sand.

3.12 FORMWORK SCHEDULE

A. Footings and Walls, Not Exposed to View: Site fabricated plywood or lumber, coated with form release agent.

B. Footings and Walls, Exposed to View: Site fabricated plywood, coated with form release agent compatible with applied finish coatings.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete and masonry.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Division 26 - Electrical: Grounding connection to concrete reinforcement.

1.03 REFERENCE STANDARDS

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

B. ACI MNL-66 - ACI Detailing Manual.

C. ACI SPEC-301 - Specifications for Concrete Construction.

D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

F. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

G. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

J. AWS A5.5/A5.5M - Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding.

K. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars.

L. CRSI (DA4) - Manual of Standard Practice.

M. CRSI (P1) - Placing Reinforcing Bars, 10th Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data:

1. Reinforcement supporting and spacing devices at exposed concrete only, to demonstrate non-corroding and non-staining characteristics.
2. Adhesive compounds.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

F. Quality Control Submittals: Submit the following information related to quality assurance requirements specified:

1. Certifications: Submit to the testing laboratory mill test certificates for all reinforcing steel, showing physical and chemical analysis. If steel is to be welded, include in chemical analysis the percentages of carbon, manganese, copper, nickel, and chromium, and optionally the percentages of molybdenum and vanadium.
2. Certifications: If steel is to be welded, submit certifications to the testing laboratory signed by AWS Certified Welding Inspector (CWI) of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualification of welding operators, and qualification of welders.

G. Welding Procedure Specification Submittal: Submit to Testing Laboratory written Welding Procedure Specifications (WPS) as defined by AWS D1.4/D1.4M. The WPS shall be prepared by the Fabricator for review and approval by the Architect (Structural Engineer) and Testing Laboratory as complying with specified criteria, and shall be readily available to the welding inspector.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI CODE-318, ACI MNL-66, ACI SPEC-301, ASTM A184/A184M, and CRSI (P1).

1. Maintain one copy of each document on project site.

B. Regulatory Requirements: Conform to California Building Code (CBC) Title 24 Part 2, Chapter 19A requirements as amended and adopted by authorities having jurisdiction, for details of reinforcement.

C. Provide Architect, Project Inspector, and Special Inspector with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.4/D1.4M and no more than 12 months before start of scheduled welding work.

1. Only AWS Certified Welding Inspectors shall be used for tests and qualifications associated with welding of reinforcing steel.
2. Only AWS qualified welders or welding operators shall perform welding of reinforcing steel.

E. Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses.

F. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect (Structural Engineer) before proceeding.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver reinforcement bars new and free from rust and mill scale in original bundles marked with durable identification tags.

B. Storage: Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening coatings.

C. Handling: Take precautions to maintain reinforcement identification after bundles are broken.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Reinforcing Steel: ASTM A706/A706M, Grade 60 (60,000 psi), deformed low-alloy steel bars.
   1. Unfinished.
   2. Carbon Content: 0.55 % maximum.

C. Reinforcing Steel: #3 Deformed bars, ASTM A615/A615M Grade 40 (280), Type A.

D. Tie Wire: ASTM A1064/A1064M steel wire, unfinished.

E. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Wire-bar-type devices, complying with CRSI (DA4), for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place. Sized and shaped for adequate support of reinforcement during concrete placement.
      a. Supports at Slab on Grade: Provide devices with load-bearing pads or horizontal runners where base material does not support chair legs, to prevent puncture of vapor retarder/barrier or provide precast concrete block bar supports of equal or greater strength to specified concrete.
      b. Corrosion Resistance:
         1) Provide stainless steel or plastic components for placement within 1-1/2 inches of weathering surfaces.
            (a) Provide plastic coated, plastic-tipped (CRSI, Class 1) or stainless steel types at exposed-to-view concrete surfaces.
            (b) Provide only stainless steel (CRSI Class 2) at exterior exposed surfaces to be painted.
   3. Welding Electrodes: AWS A5.5/A5.5M E80XX, low hydrogen, with a minimum yield point of 80,000 psi, for welding grade 60 reinforcing steel.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing 160% of steel reinforcing design strength in tension and compression.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; Type II capable of developing 160% of steel reinforcing design strength in tension and compression.

C. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.

C. Fusion welded reinforcing steel assemblies are not permitted.

D. Locate reinforcing splices not indicated on drawings at point of minimum stress. See Structural Drawings,

1. Review locations of splices with Architect (Structural Engineer) before fabrication and placement. .

PART 3 EXECUTION

3.01 PREPARATION

A. Cleaning: Clean reinforcement to remove loose rust and mill scale, soil, and other materials which may reduce or destroy bond with concrete.

B. Adjustment and Inspection: Do not bend or straighten reinforcement in a manner injurious to material. Do not use bars with kinks or bends not shown on Drawings and reviewed shop drawings, or bars with reduced cross-section due to corrosion or other cause.

C. Do not bend bars No. 5 and larger in the field.

D. Do not bend bars more than once in the same location.

3.02 PLACEMENT

A. General: Place and secure reinforcement as specified herein, as indicated and noted on Drawings and in compliance with recommended details and methods of reinforcement placement and support specified in CRSI Placing Reinforcing Bars.

B. Place, support and secure reinforcement against displacement. Do not deviate from required position.

1. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

C. Do not displace or damage vapor barrier.

D. Accommodate placement of formed openings.

E. Maintain concrete cover around reinforcing as indicated on Structural Drawings:

F. Comply with applicable code for concrete cover over reinforcement.

1. If not otherwise indicated on Drawings or specified herein, provide concrete cover in compliance with ACI CODE-318.

G. Bond and ground all reinforcement to requirements of Division 26.

H. Coordination: Locate reinforcement to accommodate embedded products and formed openings and recesses.

I. Slab on Grade Reinforcement: Do not displace or damage vapor retarder/barrier at slab on grade.

J. Wire Reinforcement Placement: Place reinforcement in sheets as long as practicable, lapping adjoining pieces at least one full mesh and lace splices with 16 gage wire. Offset end laps in adjacent widths to prevent continuous laps. Extend reinforcement to within 1-inch of edge at slabs on grade. Cut mesh at expansion joints and full depth control joints.

K. Dowels: Secure tie dowels in place before depositing concrete. Provide No. 3 bars for securing dowels where no other reinforcement is provided.

L. Reinforcement Splices, General: Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wire tying. Comply with details and requirements of ACI CODE-318 for minimum lap of spliced bars and criteria indicated on the Drawings.

1. Clearances for Splices: Wherever possible, provide minimum 1-1/2 inch clearance between sets of splices. Stagger horizontal bars so that adjacent spices are minimum 48 inches apart.

M. Reinforcement Supports: Support reinforcement on metal chairs, spacers or metal hangers to provide required coverage and to properly locate reinforcement. Do not use wood. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

1. Support Spacing: Space chairs and accessories in conformance with CRSI Placing Reinforcing Bars.

N. Welding of Reinforcement Steel

1. Welding: Perform welding under continuous inspection and supervision of a qualified Registered Deputy Inspector employed by testing and inspection agency. Weld reinforcement as indicated on Drawings.

2. If mill test report is not available, make chemical analysis of bars representative of bars to be welded. Bars with CE above 0.75 shall not be welded.

3. No welds shall be made at bends in reinforcing bars. Welds to be 1 inch minimum from bends

O. Corrections During Concrete Placement: Maintain reinforcing steel workers on-site during placement of concrete for resetting reinforcement displaced by runways, workers and other causes.

3.03 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

1. Concrete floor slabs on grade are to be continuously inspected as recommended in the geotechnical report.

B. Inspector of Record, as specified in Section 01 45 33 - Code-Required Special Inspections and Procedures, will inspect installed reinforcement for conformance to contract documents before concrete placement.

1. Concrete floor slabs on grade are to be continuously inspected as recommended in the geotechnical report.

C. Defective Reinforcement Work: The following shall be considered defective and may be ordered to be removed and reconstructed at no change in Contract Time or Sum.

1. Bars with kinks or bends not shown on Drawings.
2. Bars injured due to bending or straightening.
3. Bars heated or bent.
4. Reinforcement not placed in accordance with Drawings and Specifications.
5. Rusty or oily bars.
6. Bars exposed in surface of concrete or without adequate concrete cover.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Joint devices associated with concrete work.

C. Miscellaneous concrete elements, including equipment pads and thrust blocks.

D. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

D. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

E. Section 32 13 13 - Site Concrete: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

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

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.

C. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction.

F. ACI PRC-302.2 - Concrete Slabs that Receive Moisture-Sensitive Flooring Materials - Guide.

G. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

H. ACI PRC-305 - Guide to Hot Weather Concreting.

I. ACI PRC-306 - Guide to Cold Weather Concreting.

J. ACI PRC-308 - Guide to External Curing of Concrete.

K. ACI SPEC-301 - Specifications for Concrete Construction.

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 50 mm [2 in.] Cube Specimens).

P. ASTM C111/C111M - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.

Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

R. ASTM C150/C150M - Standard Specification for Portland Cement.

S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

T. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

V. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

W. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

X. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

Y. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

Z. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

AA. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

BB. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

CC. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

DD. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

EE. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

FF. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

GG. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

HH. ASTM D2103 - Standard Specification for Polyethylene Film.

II. 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.

JJ. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

KK. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

LL. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

MM. CBC - California Building Code.

NN. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.

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. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

2. For membrane-forming, moisture emission-reducing, curing and sealing compound, provide manufacturer's installation instructions,.

C. Mix Design: Submit proposed concrete mix design.

1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.

2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 19 - Concrete: Design and Durability Requirements, and Chapter 26 - Construction Documents and Inspection.

a. Reports must include all the data as required to verify conformance with ACI CODE-318, Section 26.4.2.2, and the following:

1) Mix design identification number.

2) Cement certification.

3) Fly ash certification of compliance or test data.

4) Admixture data.

5) Aggregate test data.

3. Mix Designs Utilizing 15% Or More Fly Ash: Proportioning conform to ACI CODE-318, Section 26.4.3.

4. Mix Design Review and Approval Process: An engineer from a DSA approved (LEA) testing laboratory shall review the mix design report and the design professional in responsible charge of the project shall approve the mix design.

a. Review by LEA Engineer: A qualified civil engineer associated with a DSA approved (LEA) testing laboratory shall review the report for conformance with ACI CODE-318, Sections 26.4.2.2. Issue an evaluation report of findings and recommendation for either acceptance or rejection and forward his report to the design professional in responsible charge of the project.

b. Approval by the Project Engineer in Responsible Charge: Based on the findings and recommendation of the LEA engineer’s evaluation report, the project design professional in responsible charge decides whether to accept or reject the mix design. He will issue a letter stating his acceptance or rejection. The letter shall be sent to DSA, and copied to the project inspector, the LEA laboratory, and the mix design engineer.

c. Documentation by the Concrete Supplier: The concrete supplier shall submit copies of the cement certification, fly ash certification of compliance or test data, admixture data, aggregate test data, and mix design identification number to the project inspector and the LEA engineer who reviewed the mix design report.

5. Indicate proposed mix design complies with admixture manufacturer's written recommendations.

6. Mix Design: Submit mix designs prepared, stamped and signed by a Civil Engineer licensed in the State of California.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.

F. 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.

G. Test Reports: Submit report for each test or series of tests specified.

H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

I. Sustainable Design Submittals: If any wood or wood-based form materials, including supports, are permanently installed in the project, submit documentation required for sustainably harvested wood as specified in Section 01 60 00 - Product Requirements.

J. Sustainable Design Submittal: Environmental Product Declaration (EPD) Type III, ISO 14025.

K. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

L. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

M. 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 SPEC-301 and ACI CODE-318.

1. Maintain one copy of each document on site.

B. Follow recommendations of ACI PRC-305(305R) when concreting during hot weather.

C. Follow recommendations of ACI PRC-306(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. For slabs indicated to receive membrane-forming, moisture emission-reducing, curing and sealing compound, do not proceed with application unless manufacturer's representative is present for every day of placement.

F. 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.

b. Comply with CALGreen Section A5.405.4 Recycled content.

c. Comply with CALGreen Section A5.406 Enhanced Durability and Reduced Maintenance.

G. 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 Section(s) 01 40 00 - Quality Requirements and 01 45 33 - Code-Required Special Inspections and Procedures.

H. 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-UPS

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. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.

C. Mock-up may not remain as part of the Work.

1.07 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.

1.08 WARRANTY

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

B. Slabs with Porosity Inhibiting Admixture (PIA) or 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 admixture manufacturer 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.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

D. Moisture Emission-Reducing Curing and Sealing Compound, Penetrating: Provide non-prorated warranty to cover cost of flooring delamination failures for 20 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.
   2. See Section 09 05 61 - Common Work Results for Flooring Preparation.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
   1. Cement used in contact with soil shall be Type V - Sulfate Resistant.
   2. 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, 1903A.5, ACI CODE-318 Section 26.4.
   3. Other than Structural Concrete: Conform to requirements for structural concrete.

C. Fly ash and raw or calcined natural pozzolans to conform to ASTM C618 for Class N or F (Class C fly ash is not permitted). Per ASTM C618, sampling and testing of fly ash in accordance with ASTM C111/C111M.
   1. Conform to ACI CODE-318 Section 26.4.2.2 for the use of fly ash or natural pozzolan.

2. Fly Ash: ASTM C618, Class N or F.
    a. Supply fly ash by an experienced producer that complies with all applicable standards above.
    b. Provide fly ash from one source for the duration of the project, unless additional physical testing of the changed mix is performed; per Concrete Mix Design.
3. Calcined Pozzolan: ASTM C618, Class N.

D. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.

E. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
3. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).
4. Products:
    a. Basis of Design Product: SikaColor-100 P as manufactured by Sika, or equal.
    b. Butterfield Color: www.butterfieldcolor.com/#sle.
    c. Davis Colors: www.daviscolors.com/#sle.
    d. Euclid Chemical Company; COLOR-CRETE: www.euclidchemical.com/#sle.
    e. Sika Corporation; SikaColor-100 P (Formerly CHROMIX® P) Batching Admixtures for Color-Conditioned® Concrete: usa.sika.com.
    f. Solomon Colors; Solomon ColorFlo Liquid Colors: www.solomoncolors.com/#sle.
    g. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. The use of any chemical admixture is subject to prior approval by DSA.

B. 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:

C. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

D. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
1. Products:
    a. Euclid Chemical Company; ACCELGUARD 80: www.euclidchemical.com/#sle.
    b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
1. Provide pigmented type, with ASTM C979/C979M inorganic pigments.

F. Water Reducing Admixture: ASTM C494/C494M Type A.

1. Products:

a. Euclid Chemical Company; EUCON NW: www.euclidchemical.com/#sle.

b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

G. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs). Closes capillary systems formed during concrete curing to reduce moisture vapor emission and transmission. Reduces concrete shrinkage with no adverse effect on concrete properties or applied flooring.

1. Provide admixture in slabs to receive adhesively applied flooring or roofing.

2. Provide admixture in concrete for elevator pits, retaining walls, water-retaining structures, underground structures, roads, dams, and bridges.

3. VOC Content: Zero.

4. 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.

5. 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.

6. Products:

a. AVECS, LLC; PRO-ACT: www.avecs.build/#sle.

b. Barrier One Concrete Admixtures; MVRA-CPS: www.barrierone.com/#sle.

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.spggogreen.com/#sle.

f. Or Equal 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. Performance Requirements:

a. Comply with ACI PRC-302.1 and ACI PRC-302.2.

b. Water Vapor Permeance: Not more than 0.010 perms, maximum.

1) Permeance as tested after conditioning (ASTM E1745).

c. Comply with ASTM E1745 Class A.

d. Puncture Resistance, ASTM D1709: 2,300 gms.

3. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
4. Products:
    a. Henry Company; Moistop Ultra 15: www.henry.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/#sle.
    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 nonmetallic 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 ponds per square inch.
5. Products containing aluminum powder are not permitted.
6. Flowable Products:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. LATICRETE International, Inc; DURAGROUT: www.laticrete.com/#sle.
    c. SpecChem, LLC; SC Precision Grout: www.specchemllc.com/#sle.
    d. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/#sle.
    e. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
7. Low-Slump, Dry Pack Products:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic 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.
3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.
4. Products:
    a. Euclid Chemical Company; E3-DEEP POUR: www.euclidchemical.com/#sle.
    b. Dayton Superior Corporation; SURE-GRIP High Performance (HP): www.daytonsuperior.com/#sle.
    c. Five Star Products, Inc; Five Star DP Epoxy Grout: www.fivestarproducts.com/#sle.
    d. W. R. Meadows, Inc; REZI-WELD 3/2: www.wrmeadows.com/#sle.
    e. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
    1. Products:
        a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
        b. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
        c. W. R. Meadows, Inc; ACRY-LOK: www.wrmeadows.com/#sle.
        d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Epoxy Bonding System:
    1. Complying with ASTM C881/C881M and of Type required for specific application.
    2. Products:
        a. Adhesives Technology Corporation; CRACKBOND 2100 MV: 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: www.daytonsuperior.com/#sle.
        g. Mapei Corporation; Planibond AE: www.mapei.com/#sle.
        h. Mapei Corporation; Planibond 3C: www.mapei.com/#sle.
        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. Or Equal 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 forming 1/2-inch deep sealant pocket after removal.

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

D. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
1. Products:
    a. W. R. Meadows, Inc; Speed-E-Joint: www.wrmeadows.com/#sle.
    b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
2. Height: To suit slab thickness.

F. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.

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. Products:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
    c. Nox-Crete Inc; Monofilm: www.nox-crete.com/#sle.
    d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
    e. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
    f. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid 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. CONC-2.
2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
3. VOC Content: Less than 100 g/L.
4. Solids Content: 25 percent, minimum.
5. Products:

a. Floor Seal Technology, Inc; VaporSeal 309: www.floorseal.com/#sle.

b. Forta Corporation: www.forta-ferro.com/#sle.

c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

C. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, nonyellowing acrylic; complying with ASTM C1315 Type 1 Class A.

1. Vehicle: Water-based.
2. Solids by Mass: 25 percent, minimum.
3. VOC Content: Ozone Transport Commission (OTC) compliant.
4. Products:
   a. LATICRETE International, Inc; LUMISEAL FX: www.laticrete.com/#sle.
   b. Mapei Corporation; Mapecure UV WB: www.mapei.com/#sle.
   c. W. R. Meadows, Inc; VOCOMP-30: www.wrmeadows.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Moisture-Retaining Sheet: ASTM C171.

1. Curing paper, regular.
2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.

E. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.

F. Water: Potable, not detrimental to concrete. ASTM C1602/C1602M per ACI CODE-318 Sec. 26.4.3.1

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations and ACI CODE-318.

1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendation.

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 SPEC-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 PRC-211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
5. Water-Cement Ratio: As indicated on Structural Drawings.

6. Maximum Slump: As indicated on Structural Drawings.
7. Maximum Aggregate Size: As indicated on Structural Drawings.
    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.
    b. Other than Structural Concrete: Conform to requirements for structural concrete.

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.

C. Do not use shrinkage-reducing admixture (SRA) in same concrete batch with MVRA or PIA.

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. Examine areas to receive reinforced vapor retarders. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

E. Subbase: Per ACI PRC-302.1.
1. As indicated on Drawings and approved by the Geotechnical Engineer.
    a. Minimum 4 inch thick (or larger) base of 1/2 inch or larger clean aggregate, per CA Green Code 4.505.2.1 and CBC 1907A.1.

F. 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.

G. Verify that all embedded products and formed openings and recesses are correctly placed.

H. At slabs on grade, verify that vapor retarder/barrier is properly placed and free of damage.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. 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.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. 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.

E. 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. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on 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. Minimum 4 inch thick (or larger) base of 1/2 inch or larger clean aggregate, per CA Green Code 4.505.2.1 and CBC 1907A.1.
    c. Seam and Lap Sealing: With adhesive mastic and adhesive sealing tape, seal all seams, edges and penetrations of vapor retarder/barrier.
        1) For adhesive mastic seal, apply adhesive to both surfaces, allow approximately 10 minutes to set up and then press together smoothly and evenly, without gaps or fishmouths, for full contact bond.
        2) For adhesive tape seal, comply with manufacturer's instructions and recommendations.
        3) Seal all penetrations with both adhesive sealing tape and adhesive mastic.
        4) Seal sheets to concrete footing faces and penetrating components with adhesive mastic or double sided tape as recommended by membrane manufacturer.
2. 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.

3.03 CONCRETE MIXING

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

3.04 PLACING CONCRETE

A. Notify District's Inspector and at least 2 working days in advance of placing concrete.

B. Place concrete in accordance with ACI PRC-304.

1. General: Comply with ACI CODE-318, as adopted by CBC, Title 24, Part 2, Chapter19A and as follows:
    a. Schedule continuous placement of concrete to prevent the formation of cold joints.
    b. Deliver ready mix concrete in accordance with ASTM C94/C94M. Place concrete within 90 minutes after start of mixing.
    c. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
        1) Submit for review, proposed locations of joints prior to pouring. See Structural Drawings for additional requirements.
    d. Deposit concrete as close as possible to its final location, to avoid segregation.
2. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
    a. 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.
    b. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
    c. Do not use vibrators to move concrete laterally.

C. Hot Weather Placement: Comply with recommendations of ACI PRC-305 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.

D. Cold-Weather Placement: Comply with provisions of ACI PRC-306 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.

E. Place concrete for floor slabs in accordance with ACI PRC-302.1.

1. Schedule continuous placement and consolidation of concrete within planned construction joints.
2. Place concrete in linear pattern, with control joints at slab on grade conditions only, with joints located as indicated on the Drawings.
3. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds or vibrating laser screed as described below.
4. 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.
    b. Create control and construction joints true to line and profile. Do not radius the joints. Refer to the Drawings for structural requirements of joints.
    c. Locate joints as indicated on the Drawings but in no case shall joint spacing exceed 15 feet or 36 times the slab thickness in both directions and maximum area between joints shall not exceed 200 square feet. Locate joints on column centers and at re-entrant corners where possible.
    d. 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.
    e. Alternate control and construction joint products and procedures will be considered in accordance with substitution provision specified in Section 01 60 00 - Product Requirements.

F. Notify Architect not less than 24 hours prior to commencement of placement operations.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Ensure reinforcement, inserts, and waterstops will not be disturbed during concrete placement.

I. 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.

J. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

1. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

1. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 92 00 for finish joint sealer requirements.

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.
2. Separate slabs on grade from vertical surfaces with joint filler.
3. 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.
    a. Structural slab contact at foundation walls and grade beams shall be doweled as detailed.

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 8 hours after placing; use 1/4 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.

3.06 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.
2. Under Seamless Resilient Flooring: 1/8 inch in 10 feet.
3. Under Carpeting: 1/4 inch in 10 feet.

C. 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.

1. Slabs receiving resilient athletic flooring as specified in Section 09 65 66 - Resilient Athletic Flooring.

D. Curbs:

1. Top of Curb: 1/4 inch in 10 ft, non-cumulative.
2. Side of Curb: 1/8 inch in 10 ft, non-cumulative, vertical and horizontal.

E. Correct the slab surface if tolerances are less than specified.

F. 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.

3.07 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. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include resilient flooring.
2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. 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 ponding, water-saturated sand, 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.

3.09 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. Us 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.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

C. Provide free access to concrete operations at project site and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

E. 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.

F. Field Tests of Concrete: Perform tests in accordance with applicable California Building Code requirements, ACI SPEC-301 and requirements of authorities having jurisdiction.

G. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

H. Compressive Strength Tests: ACI CODE-318, 26.12.2.1(a), ASTM C39/C39M, for each test, mold and cure a minimum of four concrete test cylinders. Project Inspector to obtain test samples each day, for every 50 cubic yards, 2,000 sq. ft. of slab or wall surface area, or less of each class of concrete placed. CBC 1905A.1.15

1. Take additional samples for 7-day compressive strength tests for of each class of concrete at the beginning of of concrete work or whenever the mix or aggregate is changed.
2. Test one cylinder at 7 days and two at 28 days after placement.
3. Maintain fourth cylinder to be tested at 56 days only if 28-day test fails to meet strength requirement.
4. 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.
5. Comply with ACI CODE-318, 26.12.3 Acceptance Criteria for Standard-Cured Specimens.
    a. Strength level of a concrete mixture shall be acceptable if (1) and (2) are satisfied:
        1) Every average of any three consecutive strength tests equals or exceeds fc'.
        2) No strength test falls below fc' by more than 500 psi if fc' is 5000 psi or less; or by more than 0.10fc' if fc' exceeds 5000 psi.
    b. If either of the requirements of 26.12.3.1(a) is not satisfied, steps shall be taken to increase subsequent strength tests.
    c. Requirements of 26.12.6 for investigating strength tests shall apply if the requirements of 26.12.3.1(a)(2) are not met.

I. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

J. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

K. 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.

3.11 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.

3.12 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 04 01 00
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water cleaning of brick surfaces.

B. Replacement of brick units.

C. Repointing mortar joints.

D. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 05 11 - Masonry Mortaring and Grouting.

B. Section 04 20 00 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1. Require attendance of parties directly affecting work of this section.
2. Review conditions of installation, installation procedures, and coordination with related work.

B. Scheduling:

1. Perform cleaning and washing of masonry between the hours of 7 am to 11 pm only.
2. Perform blast cleaning of masonry between the hours of 7 am to 11 pm only.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds.

C. Shop Drawings: Indicate setting details of stone. Detail shoring.

D. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

1.06 QUALITY ASSURANCE - MASONRY WORK

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1. Maintain one copy of each document on project site.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.07 MOCK-UPS

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

B. Restore and repoint an existing masonry wall area sized 8 feet long by 6 feet high; include in mock-up area instances of mortar, accessories, wall openings, and flashings.

C. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.

1. Repeat, using different cleaning methods for up to three different panels.

D. Locate where directed.

E. Acceptable panel and procedures employed will become the standard for work of this section.

F. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Store restoration cleaner materials in manufacturer's packaging.

1.09 FIELD CONDITIONS - MASONRY WORK

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Do not blast clean or use process creating dust, dirt, when wind is over 10 mph.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Restoration and Cleaning Chemicals:

1. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
2. HMK Stone Care System: www.hmkstonecare.com/#sle.
3. PROSOCO: www.prosoco.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

2.03 MORTAR MATERIALS

A. Comply with requirements of Section 04 05 11.

2.04 MASONRY MATERIALS

A. Brick: Section 04 26 16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

E. Close off adjacent occupied areas with dust proof and weatherproof partitions.

F. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

G. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

H. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry as directed.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Ensure that anchors are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.05 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at all work locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.06 CLEANING NEW MASONRY

A. Verify mortar is fully set and cured.

B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

C. Scrub walls with cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.

3.07 RESTORATION CLEANING

A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

B. Spray coat masonry with restoration cleaner, mixed into solution in accordance with manufacturer's instructions.

C. Provide a second application if required to match mock-up area.

D. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.

E. Rinse from the bottom up with potable water applied at 400 psi and at a rate of 4 gal/min.

3.08 AGING

A. Rub in new masonry work to match, as close as possible, adjacent original work.

B. After each application, dust off surplus and wash down with low pressure hose. Allow surface to dry before proceeding with succeeding applications.

C. Continue process until acceptance.

3.09 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

SECTION 04 26 16
ADHERED MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin Brick. BR-1

B. Mortar.

C. Adhesives.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 01 00 - Maintenance of Masonry.

B. Section 04 05 11 - Masonry Mortaring and Grouting.

C. Section 06 10 00 - Rough Carpentry: Wood stud backup for masonry veneer.

D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 27 00 - Air Barriers: Air barrier over sheathing.

F. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

G. Section 09 22 36 - Lath: Metal furring and lathing for plaster.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).

B. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.

C. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.

D. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.

E. ASTM C91/C91M - Standard Specification for Masonry Cement.

F. ASTM C150/C150M - Standard Specification for Portland Cement.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

H. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

I. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.

J. ASTM C847 - Standard Specification for Metal Lath.

K. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

L. ASTM C1088 - Standard Specification for Thin Veneer Brick Units Made from Clay or Shale.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

N. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

O. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.

P. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

Q. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

R. UL (FRD) - Fire Resistance Directory.

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. Product Data: Provide data for thin brick units, mortar, grout, and adhesive.

C. Samples: Submit four samples of thin brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that thin brick units, adhesives, mortar, and grout meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the 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: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 MOCK-UPS

A. Construct a mock-up panel sized 4 feet long by 3 feet high; include mortar, grout, adhesives, accessories, substrate, and representative wall openings in mock-up.

B. Locate where directed.

C. 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.

B. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.09 FIELD CONDITIONS

A. Do not install adhesives in an unventilated environment.

B. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 THIN BRICK

A. Manufacturers: or equal. Match existing.
   1. Basis of Design: Interstate Brick: interstatebrick.com.
   2. Endicott Clay Products Co: www.endicott.com.
   3. Pacific Clay Products Inc: www.pacificclay.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thin Brick: ASTM C1088.
   1. Type: TBX.
   2. Size: Manufacturer's standard Modular. Size as indicated on Drawings
   3. Thickness: 5/8 inch.
   4. Tolerances: 1/16 inch.
   5. Color, Texture, Range, Special Shapes: As indicated on the drawings.
   6. Protective Coating: None.

2.02 ADHESIVE MATERIALS

A. Manufacturers: or equal.
   1. Prospec, an Oldcastle brand: www.prospec.com.
   2. LATICRETE International, Inc; LATICRETE MVIS Hi-Bond Veneer Mortar: www.laticrete.com/#sle.
   3. Mapei Corporation: www.mapei.com/#sle.
   4. Sika Corporation; Masonry Veneer Adhesive: www.parexusa.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thin-Set Mortar: ANSI A118.4, polymer-modified; freeze-thaw stable.

C. Epoxy Adhesive: thinset bond type.

D. Thin Brick Setting Adhesive: Elastomeric, waterproof, liquid applied.

2.03 MORTAR MATERIALS

A. Masonry Cement: ASTM C91/C91M Type S.
   1. Colored mortar: Premixed cement as required to match Architect's color sample.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Portland Cement: ASTM C150/C150M, Type I.

C. Grout Aggregate: ASTM C404.

D. Water: Clean and potable.

2.04 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C270, Proportion Specification and ASTM C1714/C1714M.

1. Exterior, non-loadbearing masonry: Type S.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.05 FLASHINGS

A. Metal Flashing Materials: Copper, see Section 07 62 00.

B. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch thick.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

2.06 LATH

A. Metal Lath Materials: See Section 09 22 36 - Lath.

B. Metal Lath with Rainscreen Drainage Material: Factory-assembled combination of mesh drainage material and metal lath.

1. Diamond Mesh Metal Lath: ASTM C847, galvanized, self-furring.

a. Weight: To suit application and as specified in ASTM C841 for framing spacing.

b. Weight: 2.5 lb/sq yd, minimum.

2.07 ACCESSORIES

A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

B. Water-Resistive Barrier: See Section 07 25 00.

C. Air Barrier: See Section 07 27 00.

D. Rainscreen Drainage Material:

1. Drainable Housewrap: Combination drainage layer/water-resistive sheet.

a. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

b. Seam and Perimeter Tape: As recommended by housewrap manufacturer.

c. Manufacturers:

1) Benjamin Obdyke Inc: www.benjaminobdyke.com/#sle.

2) DuPont Building Innovations: www.dupont.com/#sle.

3) Henry Company: www.henry.com/#sle.

4) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive thin brick veneer.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for installation of thin brick veneer.

3.02 INSTALLATION

A. Exterior Applications: Comply with TCNA (HB) Method W201, W202, or W244E.

1. Comply with CBC Section 1404.10 and Sections 12.1 and 12.3 of TMS 402 (TMS 402/602).

B. Install lath and furring for Portland cement plaster in accordance with ASTM C1063.

C. Install lath and furring for UL-tested, fire-rated assemblies in accordance with the requirements of the indicated assembly.

D. Install metal lath with rainscreen drainage material in accordance with the manufacturer's instructions.

E. Lath Installation:

1. Apply metal lath taut, with long dimension perpendicular to supports.
2. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.
3. Lap sides of diamond mesh lath minimum 1-1/2 inches.
4. Attach metal lath to wood supports using nails at maximum 6 inches on center.
5. 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.
6. Place corner bead at external wall corners; fasten at outer edges of lath only.
7. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.
8. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
9. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Veneer Units:

1. Bond: As indicated for different locations.
2. Coursing: Three units and three mortar joints to equal 8 inches.
3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

A. Remove excess mortar as work progresses.

B. Interlock intersections and external corners.

C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove and replace.

D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions at least 6 inches, minimum, to form watertight pan.
2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip.

C. Extend plastic, laminated, and EPDM flashings to within 1/4 inch of exterior face of masonry.

D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.06 CONTROL AND EXPANSION JOINTS

A. Size joints in accordance with Section 07 92 00 for sealant performance.

B. Form joints as detailed on drawings.

3.07 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

3.08 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.09 FIELD QUALITY CONTROL

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

B. Test for bond to the backing in accordance with TMS 402, Section 6.3.2.4.

C. Coordination of Other Tests and Inspections: District will employ independent testing agency to test and/or inspect veneer; provide access and equipment as required to accommodate timely performance.

3.10 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.11 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

B. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual.

B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.

C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.

D. AISC 341 - Seismic Provisions for Structural Steel Buildings.

E. AISC 360 - Specification for Structural Steel Buildings.

F. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

I. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

K. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

L. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).

M. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

N. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

O. 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.

P. 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.

Q. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

R. ASTM E23 - Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.

S. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film.

T. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.

U. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry.

V. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

W. ASTM E709 - Standard Guide for Magnetic Particle Testing.

X. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

Y. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series.

Z. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

AA. 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.

BB. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

CC. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

DD. AWS D1.1/D1.1M - Structural Welding Code - Steel.

EE. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

FF. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.

GG. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.

HH. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

II. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

JJ. SSPC-SP 2 - Hand Tool Cleaning.

KK. SSPC-SP 3 - Power Tool Cleaning.

LL. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections.
3. Indicate cambers and loads.
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

F. Materials Test Reports: Submit independent test results or engineered performance analysis of structural thermal-break pad performance in bearing or slip-critical connections where shear and moment loads are applied.

G. Sustainable Design Submittal: Environmental Product Declaration (EPD) Type III, ISO 14025.

H. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

I. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Maintain one copy of each document on site.

C. Fabricator: Company specializing in performing the work of this section with minimum five years of documented experience.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

F. Erector: Company specializing in performing the work of this section with minimum five years of documented experience.

G. Inspection: The District will employ a special inspector during all welding, and high-strength bolt installations and tightening operations, in accordance with California Building Code (CBC) requirements and other requirements of authorities having jurisdiction

1. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.
    a. Special Inspector: AWS-CWI qualified inspector approved by DSA for all welding.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable provisions of the following building codes, including special inspection provisions:

1. California Building Code (CBC), Chapters 17A and 22A.

B. Comply with applicable provisions of the following specifications and documents as modified by the building codes:

1. AISC 341, Supplement No. 1 and No.2.
2. AISC 358.
3. AISC 360 including high-seismic applications.
4. AWS D1.1/D1.1M, "Structural Welding Code-Steel".
5. AWS D1.8/D1.8M, "Structural Welding Code-Seismic Supplement".
6. RCSC (HSBOLT).

2.02 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.

1. Unless indicated as Grade 50 on Drawings.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

E. Cold-Formed Hollow Structural Sections (HSS): ASTM A1085/A1085M, Grade 50, or ASTM A500/A500M, Grade C..

F. Steel Bars: ASTM A108.

G. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

H. Pipe: ASTM A53/A53M, Grade B, Finish black.

I. Structural Bolts and Nuts: As indicated on Structural Drawings.

J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

K. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

L. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

M. Headed Anchor Rods: ASTM F1554 Grade 36, plain.

N. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

O. Welding Materials: AWS D1.1/D1.1M and AWS D1.8/D1.8M; type required for materials being welded.

1. Provide E70XX-low hydrogen electrodes for shielded metal arc welding.
2. Provide E71TXX wire type for flux-cored arc welding.
3. The filler metal used for the welding of all members of the lateral load resisting system, shall have a notch toughness not less than 20 ft.-lbs. at 0 degrees F per AISC 341 Section A4a. as measured by a standard Charpy V-notch test, ASTM E23, in accordance with the applicable filler metal specification referenced in AWS D1.1/D1.1M and Seismic Supplement AWS D1.8/D1.8M.
4. All demand critical welds of the lateral load resisting system shall have a notch toughness of not less than 40 ft.-lbs. at 70 degrees F per AISC 341 Section A4b as measured by a standard Charpy V-notch test, ASTM E23, in accordance with the applicable filler metal specification referenced in AWS D1.1/D1.1M and Seismic Supplement AWS D1.8/D1.8M.

P. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Provide minimum compressive strength as indicated on Drawings.
2. Height Change, Plastic State; when tested according to ASTM C827/C827M:
a. Maximum: Plus 4 percent.
b. Minimum: Plus 1 percent.

Q. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
1. SSPC-Paint 15, standard color.
2. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

R. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Develop required camber for members.

2.04 FINISH

A. General: Materials and fabrication procedures shall be subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency, as specified in Section 01 40 00 - Quality Requirements and Section 01 45 33 - Code-Required Special Inspections and Procedures.
1. Such inspections and tests do not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
2. Promptly remove and replace materials or fabricated components that do not comply.

B. Prepare structural component surfaces in accordance with SSPC-SP 3.

C. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

D. Galvanize all exterior structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.05 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 100 percent of bolts at each connection.

C. Welded Connections: Visually inspect contintuously or periodically per the DSA Form 103 all shop-welded connections and test at least 100 percent of welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94/E94M.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
4. Magnetic particle inspection performed in accordance with ASTM E709.
    a. Performed on root pass and on finished weld.
    b. Cracks or zones of incomplete fusion or penetration not acceptable.

D. See also part 3 article "Field Quality Control".

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Level and plumb individual members of structure within specified AISC tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

1. Special Inspector: AWS-CWI qualified inspector to inspect all welds.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts."

C. Welded Connections: Visually inspect contintuously or periodically per the DSA Form 103 all field-welded connections and test at least 100 percent of welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94/E94M.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
4. Magnetic particle inspection performed in accordance with ASTM E709.

D. Report: AWS-CWI Welding inspector will submit a signed report to the Architect, Structural Engineer, Project Inspector, and Authority Having Jurisdiction (Division of the State Architect) verifying that welding was performed in compliance with specified and Code-mandated requirements and that adequate methods were used to determine the quality of the welding.

E. Re-Inspection: After correction of deficiencies in structural steel work which inspections and test reports indicate, additional inspections and tests will be performed to confirm that structural steel complies with specified requirements. Costs of re-inspections shall be paid in accordance with Conditions of the Contract.

3.05 CLEANING AND TOUCH-UP

A. Cleaning: Perform initial cleaning immediately after completion of installation. Prepare surfaces for finish painting.

B. Galvanizing Touch-Up: Touch up galvanizing immediately after installation, including field welding.

1. Prepare surface and apply cold galvanizing compound in compliance with ASTM A780/A780M and the manufacturer's instructions and recommendations.

C. Primer Paint Touch-Up: Touch up shop paint immediately after erection. Use products compliant with Section(s) 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting.

1. Clean exposed areas of rust, field welds, bolted joints, and areas where primer is damaged by SSPC-SP 2 hand tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Paint with applicable SSPC-Paint 15 (interior) or SSPC-Paint 20 (exterior) compliant material used for shop painting, minimum 3 mils dry film thickness.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Supplementary framing for openings up to and including 18 inches.

C. Bearing plates and angles.

D. Stud shear connectors.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches.

B. Section 05 50 00 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.03 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.

B. ASTM A29/A29M - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

G. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel.

J. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

K. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

L. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems.

M. ICC-ES AC70 - Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements.

N. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks.

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

Q. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

1. Provide the following data as verified by IAPMO or ICC Evaluation Service Reports:

a. Non-composite flexural effective section moduli and moments of inertia.

C. Structural design of the system using the products shown on the Drawings has already been used as a basis of approval by Division of the State Architect and other agencies.

1. 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.

2. See Section 01 60 00 - Product Requirements.

D. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

1. Field Measurements: Before starting shop and erection drawings, verify measurements, lines, grades, elevations, locations and details of field conditions and be responsible for correctness, conformance, accuracy and execution of construction to conform to actual conditions.

2. Detail the construction in conformance with the AISC Detailing for Steel Construction, 2nd Edition, except where otherwise indicated.

3. Field Connections and Placement Diagrams: Show field connection and placement diagrams on the erection drawings with complete details, layouts and dimensions.

4. Changes: Minor, non-structural changes from the design drawings may be shown on the shop and erection drawings provided they are clearly indicated as such. Structural changes must have prior approval from the Architect and Division of the State Architect (DSA) Structural Safety Section.

E. Certificates: Certify that products furnished meet or exceed specified requirements.

1. Insurance Certification: Assist the District in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

2. The equivalency of all proposed decking is subject to acceptance by the Architect.

F. Submit manufacturer's installation instructions.

G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

H. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

C. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

D. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.

1. Special Inspector: AWS-CWI qualified inspector approved by DSA for all welding.

1.06 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Furnish and install metal deck in accordance with the manufacturer's current ICC Evaluation Service Report and UL listing requirements to obtain diaphragm values and fire ratings indicated.

B. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:

1. ASC Steel Deck: www.ascsteeldeck.com.
    a. Structural Roof Evaluation Report: IAPMO ER-0161; 06/30/23.
2. Epic Metals Corporation: www.epicmetals.com.
    a. Evaluation Report: IAPMO ER-0226; 06/30/25.
3. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
    a. Evaluation Report: IAPMO ER-0423; 03/31/25.
4. Verco Decking, Inc (a Nucor Company): www.vercodeck.com.
    a. Evaluation Report: IAPMO ER-2018; 07/31/25.
5. Substitutions: See Section 01 60 00 - Product Requirements.
    a. Substitution may or may not be accepted after Architect and District review with complete evaluation for content and schedule impact.

b. Substitutions shall include all costs for redesign with consequential changes by other trades along with the Architect and related approvals by governing agencies. Revisions to shop drawings illustrating changes is not considered adequate for DSA review and approval.

c. Substitutions may be acceptable, based on Architect's review and approval, for submittal to DSA. If substituted manufacturer cannot reproduce DSA design and approval in a timely manner, then they shall be subject to a time and material back charge for any delays in the project. Architect approval is required prior to DSA submittal and DSA approval is required prior to installation.

2.02 STEEL DECK

A. All Deck Types: As indicated on Drawings.

B. Roof Deck: As indicated on Drawings.

1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 50/340, Class 1, 2, or 4, with G90/Z275 galvanized coating.
2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
3. Structural Properties:
   a. Span Design: Multiple.
4. Minimum Base Metal Thickness: As indicated on Drawings.
5. Nominal Height: 1-1/2 inch.
6. Profile: Fluted; SDI WR.
7. Formed Sheet Width: Per manufacturer's ICC or IAPMO approved product.
8. Side Joints: Lock seam.
9. End Joints: Welded to structure.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Stud Shear Connectors: As indicated on Drawings..

C. Welding Materials: AWS D1.1/D1.1M and AWS D1.3/D1.3M.

1. Welding Rod: AWS A5.1-91, E70XX, Low Hydrogen.

D. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.

1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
2. Material: Steel; ASTM A510/A510M.
   a. Hardness: Rockwell C 54.5, minimum.
   b. Tensile Strength: 285 kips per square inch, minimum.
   c. Shear Strength: 175 kips per square inch, minimum.

d. Washers:

1) Exposed Roof Deck Applications: 0.591 inch diameter, minimum.

e. Corrosion Resistance:

1) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.

3. Products:

a. Simpson Strong-Tie: www.strongtie.com/#sle.

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

E. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.

1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.

3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

4. Hex head, stainless steel, self-drilling screws, #12 or larger, with molded washer to create water tight and permanent seal.

F. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

1. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

I. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

1. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

J. Finish Paint: Manufacturer's baked-on, rust-inhibitive prime and finish paint, for application to metal surfaces which have been chemically cleaned and phosphate treated. Finish color as scheduled.

1. Finish field coating system of exposed decking specified in Section 09 91 13 - Exterior Painting.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, 20 gage, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

B. Roof Sump Pans: Formed sheet steel, 12 gage, 0.1046 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 2 inch (50 mm) bearing.

C. Fasten deck to steel support members as indicated on Drawings, at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.

1. Welding: Use fusion welds through weld washers.
    a. Fasten steel panels to supporting beams by electric arc welding by certified welding operators.
2. Place and secure special deep fluted sections for integral concrete bridging.

D. Fasten side seams by use of Delta Grip tool (ASC) or Punchlok tool (Verco), welding or button punching as indicated on Drawings. Provide all welding attachments or screw attachments as indicated.

1. Clinch lock seam side laps.
2. At mechanically fastened male/female side laps fasten as indicated on Drawings but not more than 24 inches on center maximum.
3. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
4. At welded male/female side laps weld as indicated on Drawings but not more than 18 inches on center maximum.

E. Weld deck in accordance with AWS D1.3/D1.3M.

F. At deck openings from 6 inches to 18 inches in size, provide 2 1/2 x 2 1/2 x 3/16 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum three flutes beyond each side of opening and fusion weld to deck at each flute.

G. At deck openings greater than 18 inches in size, provide steel angle reinforcement. as specified in Section 05 12 00.

H. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.

I. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

1. Support at Columns: As indicated on Drawings.
    a. Where, due to cutting of deck units at columns, bearing support is not provided for the end of a web, such web shall be welded to the column or structural steel material at the column or equivalent support shall be provided.

b. The welding or equivalent support shall be sufficient for the support of the deck, the "wet" weight of concrete and other construction loads.

J. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

K. Place metal cant strips in position and fusion weld.

L. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

M. Weld stud shear connectors through steel deck to structural members below.

1. The studs shall be installed only by AWS certified operators approved by the manufacturer and who are thoroughly familiar with the installation equipment. A copy of the operating instruction for the equipment shall be at the job site at all times.

2. Installation and qualification of weld base shall meet the requirements of AWS D1.1/D1.1M except as specified herein. Refer to Section 01 45 33 - Code Required Special Inspections and Procedures for inspection requirements.

3. Studs bent more than 15 degrees from the vertical by inspection and testing procedures shall be bent back to an acceptable angle and show no signs of failure if they are to be considered as part of the required studs. Otherwise they shall be replaced by additional studs.

4. Studs that shown no signs of failure will be accepted as shear connectors provided they meet the dimensional limitations indicated, provided no portion is less than one inch from a proposed concrete surface and provided bends or out of plumbness does not exceed 15 degrees.

a. In addition, studs shall have a height of 5 inches after welding to provide a concrete cover of 1 inch minimum.

5. The studs shall have complete fusion to the steel beams underlying the decking. Where repairs are made by fillet welding, such welding shall be between stud and beam with removal of portions of the decking as required.

6. Where the decking is thick due to heavy gage sheets or double sheets at cellular panels, holes in one or more sheets shall be made before stud welding when required to ensure fusion of studs to beams.

7. Remive ferrules after completion.

N. Touch Up of Welds: Upon cooling, touch-up all welds not to be encased in concrete topping with manufacturer's standard priming paint.

O. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.03 AS ERECTED DRAWINGS

A. After all steel has been erected, correct or revise the shop drawings erection and placement diagrams to correspond with the changes made in the field. Refer to requirements specified in Section 01 78 00 - Closeout Submittals.

3.04 FIELD QUALITY CONTROL

A. Field testing and inspection are specified in Section 01 45 33 - Code-Required Special Inspections and Procedures.

1. Special Inspector: AWS-CWI qualified inspector to inspect all welds.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.
   1. Custom fabricated gate and fence.

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

C. Pipe bollards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 09 91 13 - Exterior Painting: Paint finish.

C. Divisions 10 - Specialties, 22 - Plumbing, 26 - Electrical, 27 - Communications, and 28 - Electronic Safety and Security: Mounting of equipment and components.

1.03 REFERENCE STANDARDS

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

B. ACI 355.4 - Qualification of Post-Installed Adhesive Anchors in Concrete.

C. ACI 440.2R - Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.

D. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.

E. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

L. 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.

M. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

N. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

O. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.

P. ASTM F594 - Standard Specification for Stainless Steel Nuts.

Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

R. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

S. AWS D1.1/D1.1M - Structural Welding Code - Steel.

T. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

U. DSA IR 17-11 - Identification, Sampling and Testing of Threaded Steel Anchor Bolts and Anchor Rods.

V. DSA IR 22-2 - Anchor Rods (Bolts) Connecting Steel to Concrete.

W. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

X. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

Y. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

Z. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

AA. SSPC-SP 5 - White Metal Blast Cleaning.

BB. SSPC-SP 6 - Commercial Blast Cleaning.

CC. SSPC-SP 10 - Near-White Metal Wet Abrasive Blast Cleaning.

DD. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. ICC ES Reports: If requested, ICC Evaluation Service report indicating conformance with ICC-ES Acceptance Criteria.

C. 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.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172, AISC 201, or City of Los Angeles Certified Fabricator.

C. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.

1. Special Inspector: AWS-CWI qualified inspector approved by DSA for all welding.

D. 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.

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. Steel Sections: ASTM A36/A36M, for channels, angles and plates.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

E. Slotted Channel Fittings: ASTM A1011/A1011M.

F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

G. Bolts, Nuts, and Washers: As indicated on Drawings.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. 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 96 00 - High-Performance Coatings .

a. Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.

1) Shop primer for ferrous metal at exposed exterior locations: Tnemec 90E-92, ethyl silicate zinc primer, or equal.

b. Apply primer immediately following surface preparation.

J. Galvanize all exterior steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

K. 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. Furnish 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 Owner Representative 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 POST INSTALLED CONCRETE ANCHORS

A. Manufacturers:

1. Manufacturers: Provide products as indicated on the approved Structural Drawings.

2. Substitutions: Substitutions of products from manufacturer's not listed are not permitted.

a. Substitution of structural anchors requires structural calculations and DSA approval.

B. Materials:

1. Conform to Code Evaluation Report, ACI 355.4, DSA IR 17-11, and DSA IR 22-2.

2. Interior Use: For use in conditioned environments free from potential moisture, provide zinc plated carbon steel anchors.

3. Exterior Use:

a. In exposed or potentially wet environments, and for attachment of exterior cladding materials, provide stainless steel anchors.

b. Stainless steel nuts and washers shall be of matching alloy group of equal or greater strength than the rod.

c. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

4. Deformed Reinforcing Bars: Deformed steel rebar conforming to ASTM A615/A615M Grade 60. Permissible sizes as described in each adhesive products ICC report.

C. Mechancial Anchors:

1. Expansion, screw or undercut anchors having current ICC approval for use in cracked and uncracked concrete, with a published ICC Evaluation Service report.
   a. Type and size as indicated on drawings.
2. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as indicated on Drawings:
   a. Hilti, Inc. Tulsa, OK; Hilti Kwik Bolt TZ2 Carbon and Stainless Steel Anchors in Cracked and Uncracked Concrete (ICC Report ESR-4266); www.us.hilti.com.
3. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to grouted masonry are as indicated on Drawings:

D. Adhesive Anchors:

1. Cartridge Injection Adhesive Anchors: Threaded carbon steel rod, inserts, or reinforcing dowels complete with required nuts, washers, adhesive system and manufacturer's installation instructions.
   a. Type and size as indicated on drawings.
   b. Current ICC approval for use in cracked and uncracked concrete with a published ICC Evaluation Service report required.
2. Interior Use: Unless otherwise indicated on the Drawings, provide:
   a. 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).
3. Exterior Use: As indicated on the Drawings, provide stainless steel anchors.
   a. 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.
   b. All nuts shall conform to ASTM F594, unless otherwise specified.
4. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as indicated on Drawings:
5. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to grouted masonry are as indicated on Drawings:

E. Power-Driven/Powder Actuated Fasteners

1. Use only if approved by Architect, generally not permitted where not specifically indicated or in load-bearing installations; as indicated on Drawings.
   a. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 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.
   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.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

F. Galvanizing of Structural Steel Members: Galvanize all exterior steel members after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

G. Galvanizing of Non-structural Items: Galvanize all exterior steel membersafter fabrication to ASTM A123/A123M requirements.

2.07 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.

E. Post Installed Anchors

1. Verification of Conditions

a. Base Material Strength: Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.

b. Temperature of concrete surface and ambient air temperature must meet manufacturer's requirements prior to use of adhesive anchor products.

c. Embedded Items:

1) Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors.

2) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.

3) Take precautions as necessary to avoid damaging anything embedded in the concrete including electrical/telecommunications conduit, gas pipes, and plumbing pipes.

4) Notify the Architect if reinforcing steel or other embedded items are encountered during drilling.

d. Beginning of installation indicates acceptance of existing conditions.

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.

1. Touch up galvanized steel with cold galvanizing compound.

3.04 INSTALLATION OF POST-INSTALLED ANCHORS

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.

3.05 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.

3.06 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 and Procedures.

1. Special Inspector: AWS-CWI qualified inspector to inspect all welds.

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.
            (a) Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.
        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.

3.07 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 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Embedded items, welding and shop painting. Placement of anchors in concrete.

B. Section 32 13 13 - Site Concrete: Placement of anchors in concrete.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

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 A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

I. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel.

K. NAAMM AMP 521 - Pipe Railing Systems Manual.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Prepare shop drawings for all railing systems, including attachment.

3. Conform to AISC Standards, except provisions for approval/responsibility for dimensions by Architect and structural engineer do not apply.
4. Include erection drawings, elevations, and details where applicable.
5. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

D. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

B. Fabricator Qualifications:
1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Coordination: Provide templates and sleeves for incorporation of embedded items into the work specified elsewhere herein.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery, Storage and Handling, General: Protect products from deformation, marring, discoloration, soiling and corrosion.

B. Storage: Store products in enclosed, well-ventilated spaces, not in contact with soil or vegetation and not subject to inclement weather.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Regulatory Requirements: Conform to California Building Code (CBC), Title 24, Part 2, Section 11B-505 and 11B-405.8 as amended and adopted by authorities having jurisdiction.
1. Top of gripping surfaces of handrails shall be 34 inches minimum and 38 inches maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.
2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2 inches minimum.
    a. Handrail may be located in a recess if the recess is 3 inches maximum deep and 18 inches minimum clear above the top of the handrail.
3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length.
    a. Where provided, horizontal projections shall occur 1-1/2 inches minimum below the bottom of the handrail gripping surfaces.

4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4 inch minimum and 2 inches maximum.
5. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4 inches minimum and 6-1/4 inches maximum, and a cross-sectional dimension of 2-1/4 inches maximum.
6. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
7. Handrails shall not rotate within their fittings.
8. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10.
    a. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
9. A 2 inch minimum high curb or a barrier shall be provided to prevent the passage of a 4 inch diameter sphere rolling off the sides of a ramp surface.
    a. Such a curb or barrier shall be continuous and uninterrupted along the length of a ramp. CBC Section 11B-405.9.2

B. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

C. Allow for expansion and contraction of members and building movement without damage to connections or members.

D. Dimensions: See drawings for configurations and heights.
1. Top Rails and Wall Rails: 1-1/2 inches outside diameter, round.
2. Intermediate Rails: 1-1/2 inches diameter, round.

E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.

F. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

G. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
1. Ease exposed edges to a small uniform radius.
2. Welded Joints:
    a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
    b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed welded or seamless structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black and galvanized finish, as indicated, seamless or welded.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Straight Splice Connectors: Steel concealed spigots.

F. Galvanizing: In accordance with requirements of ASTM A123/A123M.

1. Touch-Up Primer for Galvanized Surfaces: Hot stick method.

2.03 FABRICATION

A. Fabricate railings in accordance with NAAMM AMP 521 and as required for specified design requirements. Provide stock and tubing and manufactured components sized and arranged as indicated on Drawings and specified herein.

B. Accurately form components to suit specific project conditions and for proper connection to building structure.

1. Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Architect.

C. Fit and shop assemble components in largest practical sizes for delivery to site.

D. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

E. Welded Joints:

1. Exterior Components (Type 2): Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

2. Interior Components (Type 1): Continuously seal joined pieces by continuous welds.

3. 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 (1/8 inch).

F. Weld connections that cannot be shop welded due to size limitations.

1. Weld in accordance with AWS D1.1/D1.1M.

2. Match shop welding and bolting.

3. Clean welds, bolted connections, and abraded areas.

4. Touch up shop primer and factory-applied finishes.

5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Coordination: Coordinate fabrication and installation of steel pipe and tube railings so that related Work accurately and properly join.

3.02 PREPARATION

A. Obtain Architect's review prior to site cutting or making adjustments not indicated on shop drawings.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with CBC 11B and ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Guardrails Installation: Install railings plumb and level, accurately fitted, free from distortion or defects.

1. Plumb posts in each direction.
2. Temporarily install sections and align before securing sections together.
3. Fully weld all joints and grind smooth as for shop welding.
4. Perform field welding in accordance with AWS D1.1/D1.1M.

3.04 TOLERANCES

A. Code required dimensions indicated on Drawings as minimum or maximum are absolute. No tolerances are allowed less or more than this dimension.

B. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

C. Maximum Offset From True Alignment: 1/4 inch.

D. Maximum Out-of-Position: 1/4 inch.

3.05 CLEANING AND PROTECTION

A. Galvanizing Repair Compound:

1. If finish is to be painted or is otherwise not visible, field repair with premixed cold galvanizing compound for field touch-up of galvanized coatings.
2. Where the finish is galvanized, resend to galvanizing for reapplication, if practical (e.g.; bolted components) and accepted by Architect.

B. Cleaning:

1. Clean and dress all field welds, bolted connections, and abraded areas of galvanizing or shop paint on miscellaneous metal.

END OF SECTION

SECTION 05 59 20
TUBE STEEL ENCLOSURE GATES

PART1 GENERAL

1.01 SECTION INCLUDES

A. Tube steel enclosure.

B. Pedestrian gates.

C. Vehicle and equipment access gates.

D. Excavation for post bases; concrete foundation for posts.

1.02 RELATED REQUIREMENTS

A. Section 09 96 00 - High-Performance Coatings: Field applied exterior metal coatings

B. Section 32 13 13 - Concrete Paving: : Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. 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.

C. 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.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.04 SUBMITTALS

A. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, hardware and accessories specified in the section.

1. Fence and gate posts, rails, and fittings.
2. Gates and hardware, including accessible gate lever lockset.
3. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

B. Shop Drawings:

1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: 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."

B. Coordination: Provide templates and sleeves for incorporation of embedded items into the Work specified in other Sections.

C. Field-Verified Dimensions: Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Owner Representative and Architect.

D. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel or equal.

E. 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.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

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 1008.2, 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 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 MATERIALS

A. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.

1. Square and Rectangular Hollow Structural Sections (HSS): Fy = 46 ksi.

B. Steel Sheet:

1. Hot-Rolled: ASTM A1011/A1011M.

2. Cold-Rolled, ASTM A1008/A1008M.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 ENCLOSURE GATES

A. Gates: Located as shown on the Drawings.

B. Gate Posts: As indicated on Drawings.

C. Gate Frame and Brace: As indicated on Drawings.

2.04 HARDWARE

A. Gate Hinges: Size as required for weight of gate, plus 20 percent. Each hinge to be capable of the entire weight of the gate panel.

1. Basis of Design Product: Series 1200 Sealed Bearing Hinge as manufactured by DoorKing, www.doorking.com; or approved equal.

2.05 FINISHES

A. Tubular Steel Framework: Paint per Section 09 96 00 - High-Performance Coatings.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 ACCESSORIES

A. Fasteners: Manufacturer's standard type to suit application; galvanized metal with soft neoprene washers.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

B. Field Touch-up Paint: As recommended by panel manufacturer.

C. Bituminous Paint: Asphalt based.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
   1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

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

3.02 PREPARATION

A. Stake locations of gates and ensure footings will not confilct with any utilities, easements, or footings.

B. If confilict occurs immediately alert General Contractor.

3.03 ON THE JOB SITE

A. After the gate has been erected and is mechanically complete, wire brush field welds, dry wipe off all loose residue, spot prime with the Zinc Chromate all bare metal, bare spots and chips, and unpainted surfaces.

3.04 FABRICATION AND INSTALLATION

A. Gates shall be welded and have smoothed, clean, slag free welds. Dimensions and installation shall be in accordance with the drawings.

B. Gates shall be set square and plumb.

3.05 POST SETTING

A. General: Comply with ACI 301 for cast-in-place concrete.

B. Materials: Portland cement complying with ASTM C 150, aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
   1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

C. All posts to be set in concrete as detailed on the drawings.

3.06 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by the manufacturer in writing for exterior applications.

3.07 SITE CLEAN UP

A. The construction site shall be cleaned up and all accumulated debris removed by the Contractor.

END OF SECTION

SECTION 06 05 73
WOOD TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field-applied termiticide for wood materials.

B. Field-applied termiticide for other building materials.

C. Field-applied mildewcide for wood materials.

D. Field-applied preservative treatment for wood materials.

E. Field-applied fire-retardant treatment for wood materials.

1.02 RELATED REQUIREMENTS

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

B. Section 06 10 00 - Rough Carpentry: Factory treatment for wood products.

1.03 REFERENCE STANDARDS

A. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

B. ASTM D3201/D3201M - Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data for wood preservative materials and application instructions.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.

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.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.06 WARRANTY

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

B. Site Applied Termiticide and Mildewcide: Correct defective Work within a twenty-five year period after Date of Final Inspection.

C. Applied Fire-Retardant Manufacturer's Warranty: Submit, for District's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights District may have under the Contract Documents.

PART 2 PRODUCTS

2.01 FIELD-APPLIED WOOD TREATMENT

A. Manufacturers:
   1. Arch Wood Protection, Inc: www.wolmanizedwood.com.
   2. Green Products Company; Copper Green: greenproductsco.net.
   3. Nisus Corporation: www.nisuscorp.com/#sle.
   4. Osmose, Inc: www.osmose.com.
   5. Viance, LLC: www.treatedwood.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Field-Applied Termiticide for Wood: Borate mineral salt based, spray applied, penetrating termiticide.
   1. Products:
      a. Nisus Corporation; Bora-Care: www.nisuscorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Field-Applied Termiticide and Mildewcide: Borate mineral salt based, spray applied termiticide, mildewcide, and mold growth preventative.
   1. Products:
      a. Nisus Corporation; Bora-Care: www.nisuscorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Field-Applied Termiticide for Wood, Steel and Concrete: Borate mineral salt based, spray applied termiticide formulated for use on wood, steel, concrete and other building materials.
   1. Active Ingredient: 40 percent minimum disodium octaborate tetrahydrate (DOT).
   2. Carrier and Penetrant: Proprietary glycol solution.
   3. Products:
      a. Nisus Corporation; Bora-Care with Mold-Care: www.nisuscorp.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Field-Applied Mold Cleaner: Nonbleaching, oxidizer based formula with high-pH tolerant surfactant. Contains no sodium hydroxide or sodium hypochlorite.
   1. Products:
      a. Nisus Corporation; Mold Clean: www.nisuscorp.com/#sle.

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

F. Surface-Applied Wood Preservative: Pressure treatment in accordance with AWPA U1, using water borne preservative.

1. Liquid Wood Preservative: Roller, spray, or injection formula.

a. Preservative Action: Fungicidal, insecticidal, and moldicidal effects.

b. Active Ingredients: Clear solution of 19.6 percent disodium octaborate tetrahydrate with 1.0 percent didecyl dimethyl ammonium chloride.

c. Carrier: Proprietary mix of propylene glycol and water.

d. VOC: 6.51 lb/gal.

G. Applied and Impregnated Fire-Retardant:

1. Performance Requirements:

a. Provide fire-retardant-treated wood that complies with the following when tested in accordance with UL 723:

1) Surface Burning Characteristics: Class A; Flame spread index of 25 or less, smoke developed index of 26 or less, when tested in accordance with ASTM E84.

2) No evidence of significant progressive combustion when the test is continued for an additional 20-minute period.

3) A flame front that does not progress more than 10½ feet beyond the centerline of the burners at any time during the 30-minute test period.

b. Provide fire-retardant-treated wood that is kiln dried after treatment (KDAT) to maximum moisture content of 19% for lumber and 15% for plywood.

c. Provide interior fire-retardant-treated wood that has a moisture content less than 28% when tested in accordance with ASTM D3201/D3201M at 92% relative humidity.

d. Provide exterior fire-retardant-treated wood that has no increase in the listed classification when subjected to the Standard Rain Test, ASTM D2898.

2. Fire-Retardant Treatment: Any treatment listed in the Department of Defense (DoD) Qualified Product List (QPL) for MIL-L-19140E at the time set for opening of bids.

3. Labeling: Label fire-retardant-treated wood as required by the code and bear the UL Classification Mark.

4. Basis of Design Product: Fire-Kote 100 manufactured by Universal Fire-Shield; www.firechemicals.com.

a. Fire Retardant and Preservative Treatment: Dip- or brush-type, non-discoloring.

1) Number of Coats: Two.

2) Recommended Reapplication Period: Five years.

5. Other Acceptable Manufacturers:

a. Flame Stop, Inc.; Flame Stop II: www.flamestop.com.

b. Hoover Treated Wood Products, Inc; Pryo-Guard (Weather Protected) and ; Exterior Fire-X (Weather exposed): www.frtw.com.

c. Universal Fire-Shield; Fire-Kote 100: www.firechemicals.com.

d. Any manufacturer listed in the UL Online Certifications Directory for Treated Lumber (BPVV) and Treated Plywood (BUGV) at the time set for opening of bids.

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

PART 3 EXECUTION

3.01 PREPARATION

A. Remove dust, dirt and other contaminants from treatment surfaces. Remove tarpaulins, dropcloths, strippable protective films, etc., from areas to be treated. Move equipment and stored materials that block or prevent product application.

B. Verify materials do not exceed the specified percent moisture content before applying wood treatment.

C. Discard pieces with defects which might impair quality or work.

D.

3.02 INSTALLATION - GENERAL

A. Provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FIELD-APPLIED WOOD TREATMENT

A. Comply with manufacturer's written mixing and application instructions.

B. Termiticide: Apply to foundations, structure, and other items indicated and as follows:

1. Structural wood and sill plates within 24 inches, minimum, of point of contact with foundation.
2. Wood, wood-based, and cellulosic sheathing within 24 inches, minimum, of point of contact with foundation.
3. Concrete foundations 2 inches, minimum, from sill plate.
4. Pipe and plumbing penetrations up to 24 inches, minimum, above slab and slab surface and within 6 inches, minimum, of pipe or penetration.
5. Apply six inches, minimum, on both sides of control joints and construction joints in slabs and joints between slabs and abutting material.

C. Mildewcide: Apply to wood and wood-based building materials indicated.

1. Structural wood and sill plates within 24 inches, minimum, of point of contact with foundation.
2. Wood, wood-based, and cellulosic sheathing within 24 inches, minimum, of point of contact with foundation.

D. Liquid Preservative: Apply to wood and wood-based building materials indicated in accordance with manufacturer's instructions.

1. Apply by roller, spray, or injection.
2. Do not apply when raining or in extremely high humidity conditions.
3. Allow preservative to dry prior to application of surface coatings.

3.04 FIRE-RETARDANT TREATMENT

A. Install fire-retardant-treated wood in accordance with code requirements and related Division 6 Sections.

B. Install interior fire-retardant-treated wood where exterior type is not indicated.

C. Install exterior fire-retardant-treated wood for weather-exposed surfaces and where indicated.

D. Apply fire-retardant and preservative treatment in accordance with product literature, technical Bulletins, and manufacturer's instructions.

1. Brush apply two coats of fire-retardant and preservative treatment.

E. Apply dip- or brush-type preservative to site-sawn ends of pressure treated materials. Allow to cure prior to erecting materials.

1. Where allowed by manufacturer field cutting of fire-retardant-treated wood to length is allowed without end-treating. Do not rip or mill lumber after fire-retardant treatment; end cuts and drilling of holes are permitted. Fire-retardant-treated plywood may be cut in any direction.

F. Do not install materials until site pre-finishing and back priming is complete and dry.

G. Install fire-retardant-treated wood using manufacturer’s recommended fasteners.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Sheathing.

E. Roof-mounted curbs.

F. Roofing nailers.

G. Roofing cant strips.

H. Preservative treated wood materials.

I. Miscellaneous framing and sheathing.

J. Communications and electrical room mounting boards.

K. Concealed wood blocking, nailers, and supports.

L. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

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

B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

C. Section 05 12 00 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

D. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

E. Section 06 17 33 - Wood I-Joists.

F. Section 06 18 00 - Glued-Laminated Construction.

G. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

H. Section 07 27 00 - Air Barriers: Air barrier over sheathing.

I. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. AFPA (NDS) - National Design Specification for Wood Construction.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

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 B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

E. ASTM F2130 - Standard Test Method for Measuring Repellency, Retention, and Penetration of Liquid Pesticide Formulation Through Protective Clothing Materials.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

H. AWPA U1 - Use Category System: User Specification for Treated Wood.

I. CBC - California Building Code.

J. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems.

K. PS 1 - Structural Plywood.

L. PS 2 - Performance Standard for Wood Structural Panels.

M. PS 20 - American Softwood Lumber Standard.

N. 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 insulated sheathing, wood preservative materials, and application instructions.

C. Evaluation Service Reports: Show compliance with specified requirements.

D. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in District's name and registered with manufacturer.

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.

B. Correct defective work within a two-year period commencing on Date of Final Inspection or Final Acceptance.

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 at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

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; Maximum 19%.

D. Stud Framing (2 by 2 through 2 by 6):

1. Species: Douglas Fir-Larch.
2. Grade: No. 1 & Better.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):

1. Species: Douglas Fir-Larch.
2. Grade: No. 1 and Better.
   a. No. 1 & Better for joists and rafters;
   b. No. 1 for beams and stringers.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 1 or Construction Grade.
2. Boards: No. 2 or Standard Grade.

2.03 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: PS 1 or PS 2 type, rated Single Floor.

1. Panel Type: Plywood.
2. Bond Classification: Exposure 1.
3. Span Rating: 48.
4. Performance Category: 1-1/8 PERF CAT.
5. Edges: Tongue and groove.

6. Products:
    a. Roseburg Forest Products; Softwood Plywood: www.roseburg.com/#sle.
    b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Sheathing: PS 1 type, rated Structural I Plywood Sheathing.
    1. Bond Classification: Exterior.
    2. Span Rating: 32/16.
    3. Performance Category: 15/32 PERF CAT.
    4. Edge: Square edge.

C. Wall Sheathing: PS 2 type plywood.
    1. Bond Classification: Exterior.
    2. Grade: Structural I Sheathing.
    3. Span Rating: 32/16.
    4. Performance Category: 15/32 PERF CAT.
    5. Edge Profile: Square edge.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood; 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.

E. Other Applications:
    1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
    2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
    3. Other Locations: PS 1, C-D Plugged or better.

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. Comply with CBC 2304.10.2.1.
        a. Exterior Wall Coverings: Provide hot dipped or mechanically deposited zinc-coated steel, stainless steel, silicon bronze or copper.
            1) Provide coating weights for mechanically deposited zinc coating fasteners complying with ASTM B695, minimum Class 55.
    2. Anchors: As indicated on Drawings.

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. Basis of Design Product: Connectors as manufactured by Simpson Strong-Tie, or approved equal.

C. Joist Hangers: 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. Basis of Design Product: Connectors as manufactured by Simpson Strong-Tie, or approved equal.

D. Termite Resistant Base Condition:

1. Termite-Resistant Sill Plate Barrier: Self-adhesive, 4 mil film-backed 64 mil barrier with release sheet; adheres to concrete substrates and blocks termite access.
    a. Thickness: 68 mil, 0.068 inch.
    b. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
    c. Water Vapor Permeance: 0.035 perm, maximum, when tested in accordance with ASTM E96/E96M.
    d. Products:
        1) Basis of Design: Polyguard Products Inc.; TERM® Sill Barrier | Termite Barrier : www.polyguardproducts.com, or approved equal.
        2) Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
2. Termite-Resistant Sill Flashing: Self-adhesive membrane; 4 mil polyethylene film bonded to 36 mil sealant.
    a. Thickness: 40 mil, 0.040 inch.
    b. Width: 12 inches, minimum.
    c. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
        1) ICC ESR 3632.
    d. Water Vapor Permeance: 0.035 perm, maximum, when tested in accordance with ASTM E96/E96M.
    e. Pesticide repellency; chlorodane, fipronil, and permethrin: 0 percent penetration, tested to ASTM F2130.
    f. Products:
        1) Basis of Design: Polyguard Products Inc.; TERM® Flashing Barrier | Termite Barrier : www.polyguardproducts.com, or approved equal.
        2) Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
3. Accessory Sealants: indicated on details to maintain warranty.
    a. Sill Barrier Sealant: Polygard Detail Sealant PW (California VOC Compliant), or approved equal.
    b. Sill Flashing Sealant : Polyguard California Sealant, or approved equal.

E. Sill Flashing: See Section 07 62 00.

F. Water-Resistive Barrier: See Section 07 25 00.

G. Air Barrier: See Section 07 27 00.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA 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 AWPA standards.

B. Preservative Treatment:

1. Products:

a. Lonza Group: www.wolmanizedwood.com/#sle.

b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com/#sle.

c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.

d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

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

b. Treat lumber in contact with roofing, flashing, or waterproofing.

c. Treat lumber in contact with masonry or concrete.

d. Treat lumber less than 18 inches above grade.

e. Treat lumber in other locations as indicated.

3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with roofing, flashing, or waterproofing.

c. Treat plywood in contact with masonry or concrete.

d. Treat plywood less than 18 inches above grade.

e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

B. 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 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA (NDS).

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

1. Comply with CBC Section 718.2 Fireblocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.

6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Equipment.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges provide solid edge blocking where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
   1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

C. 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 all 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.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 FIELD QUALITY CONTROL

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

3.10 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. Wood casings and moldings.

C. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

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

B. Section 06 10 53 - Miscellaneous Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard.

B. ANSI A208.1 - American National Standard for Particleboard.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

F. PS 1 - Structural Plywood.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with installation of associated and adjacent components.

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 wood trim 6 inch long.

E. 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. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.

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: Match existing; prepare for stained transparent 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, veneer core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, veneer 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 PANEL CORE MATERIALS

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.

1. Grade: 115; moisture resistance: MR10.
2. Panel Thickness: 3/4 inch.

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.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of indicated species.

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

2.07 SITE FINISHING MATERIALS

A. Stain and Finishing Materials: Comply with AWMAC/WI (NAAWS), unless noted otherwise.

2.08 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.09 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: Semigloss.

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.

3.02 INSTALLATION

A. Install work in accordance with AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install components with nails at 12 inch on center.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 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.

B. Hardware.

C. Factory finishing. LM-1

D. Preparation for installing utilities.

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 20 00 - Finish Carpentry: Wood trim unrelated to casework.

D. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

F. BHMA A156.9 - Cabinet Hardware.

G. CBC - California Building Code.

H. CBC Ch. 11B - California Building Code-Chapter 11B.

I. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

J. NEMA LD 3 - High-Pressure Decorative Laminates.

K. WI (CCP) - Certified Compliance Program (CCP).

L. WI (CSIP) - Certified Seismic Installation Program (CSIP).

M. 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 MOCK-UPS

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

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

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 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, CBC, CBC Ch. 11B, and ADA Standards, latest amendment.
   1. Operable parts for all accessible casework shall comply with CBC Ch. 11B-309 Operable Parts.
   2. Pull hardware shall be U-shaped wire pulls or equally accessible at all accessible casework; CBC Ch. 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. PL-1

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. 100 Series - Base Cabinets without drawers.
    b. 200 Series - Base Cabinets with drawers.
    c. 300 Series - Wall hung Cabinets.
    d. 400 Series - Tall Storage Cabinets.
    e. 500 Series - Wardrobe Cabinets.
11. Adjustable Shelf Loading: 40 psf.
    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: Manufacturer's option.
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.

2.04 HARDWOOD PLYWOOD PANELS

A. Hardwood Plywood: Plywood manufactured for nonstructural decorative applications; consisting of faces and backs applied to a variety of core types; comply with HPVA HP-1.

1. Woodwork Quality Standard: Panels complying with specified woodwork quality standard.
    a. Veneer: HPVA grade to meet the NAAWS requirements for type of surface and grade.
2. Core, Medium Density Fiberboard: Comply with ANSI A208.2.
    a. Grade: 115; moisture resistance: MR10.
        1) Comply with NAAWS, Grade 150 minimum, where required by CSIP.
    b. Construction and Thickness: 3 plies, 3/4 inch.
3. Products:
    a. Basis of Design Material: Combination Core, PureBond Classic Core, www.columbiaforestproducts.com, or approved equal.
    b. Roseburg Forest Products; SkyPly Hardwood Plywood: www.roseburg.com/#sle.
    c. Timber Products; Pro Core MDF: www.timberproducts.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 LAMINATE MATERIALS

A. PL-1 Manufacturers:

1. Arborite: www.arborite.com/#sle.
2. Formica Corporation: www.formica.com/#sle.
3. Lamin-Art: www.laminart.com.
4. Panolam Industries International, Inc: www.panolam.com/#sle.
5. Wilsonart LLC: www.wilsonart.com/#sle.
6. Or EqualSubstitutions: See Section 01 60 00 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Flame Spread Rating ASTM E84: Provide 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. CBC Table 803.13.

1. Class C Flame spread rating 26-200, smoke developed 0-450 per ASTM E84.

D. Provide specific types as indicated.

1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color as selected, textured low gloss finish.
2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, color as selected, textured low gloss finish.
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.

2.06 COUNTERTOPS

A. Countertops: See Section 12 36 00.

2.07 ACCESSORIES

A. Adhesive: Type recommended by NAAWS to suit application.

1. Type I.
2. Urea Formaldehyde adhesives shall not be used.
3. Contact Cement: VOC content of less than 80 g/l.
4. Construction adhesive shall have a VOC content compliant with Section 01 61 16.
5. Manufacturers:
   a. Franklin International, Inc; Titebond Original Wood Glue: www.titebond.com/#sle.
   b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Fasteners: Size and type to suit application.

C. 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.

D. Concealed Joint Fasteners: Threaded steel.

2.08 HARDWARE

A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:

1. Hardware Types: As indicated on drawings.
2. Product Grade: Grade 2.

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 5 mm hole diameter.: Knape & Vogt Manufacturing Company; Product No. 339: www.knapeandvogt.com.
   2. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

C. Countertop Brackets: Fixed, concealed vertical leg, side-of-stud mounting.
   1. Materials: Steel L- and T-shapes.
      a. Finish: Manufacturer's standard, factory-applied, primer.
      b. Color: Black.
      c. Vertical Leg: 26 inches, or as indicated on Drawings.
      d. Support Member Depth: 2 inches.
      e. Support Member Width: 2 inches
      f. Support Member Length: 24 inches, or as required by counter depth.
   2. Products:
      a. A&M Hardware, Inc; Concealed Brackets: www.aandmhardware.com/#sle.
      b. Centerline Brackets; Floating Wall Mount: www.countertopbracket.com/#sle.
      c. Rakks/Rangine Corporation; Inside Wall Flush Mount Brackets: www.rakks.com/#sle.
      d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. 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. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
   1. Basis of Design: 5-pin tumbler, complying with ANSI/BHMA A156.11, Grade 1 manufactured by Olympus Lock.
      a. Finish: 26D Satin Chrome.
      b. Drawer Locks: 200W.
      c. Door Locks: 100DR.
      d. Sliding Glss Door Lock: 329R (Ratchet Lock).
      e. Not acceptable: Cam type locks.
   2. Provide locks on approximately 50 percent of all cabinet doors and drawers in classrooms, except accessible sink bases, and as follows:

a. A.V. Cabinets.
b. Tall Storage Cabinets.
c. Display Cabinets.
d. Wardrobe.
e. Work Area.
f. "Personal" Drawers.
g. Filing Cabinets.
h. Workrooms to have locks on all doors and drawers.

3. Key locks alike for doors and drawers for each room and master keyed.
4. Master key project in accordance with District's keying requirements.
   a. Ccoordinate with District's keying at a keying meeting held with the Owner Representative.
   b. Provide for the District's review a keying schedule as part of the final shop drawings.
5. Metal Strike Plates: Provide cabinet door and drawer locks with metal strike plates to protect against particle board rip out.
6. 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.
7. Locks shall be easily rekeyable pin tumbler with working top slide and retainer staple.
8. Cabinet Locks:
   a. Olympus Lock; Product 500DR: www.olympus-lock.com.
   b. Corbin Cabinet Lock; Product 0737 Drawer Lock: www.cclsecurity.com.
   c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
9. Drawer Locks:
   a. Olympus Lock; Product 600DW: www.olympus-lock.com.
   b. Corbin Cabinet Lock; Product 0738 Drawer Lock: www.cclsecurity.com.
   c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

F. Cabinet Catches and Latches:
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.epcohardwareecurity.com.
   c. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
   d. Rockler Companies, Inc: www.rockler.com/#sle.
   e. Stanley Architectural Hardware; Product CD46.
   f. Or Equal 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.epcohardwareecurity.com.

c. Ives; Product 2-A92: www.iveshinges.com.

d. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.

e. Rockler Companies, Inc: www.rockler.com/#sle.

f. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

G. 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.

c. Drawer slide capacity with paper storage: 200 pounds.

3. Mounting: Side mounted.

4. Stops: Positive type.

5. Features: Provide self closing/stay closed type.

a. With rolling balls, steel rollers and self-lubricating bearings.

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. Blum, Inc; MOVENTO: www.blum.com/#sle.

d. Grant Hardware Company, Division of Hettich International: www.hettichamerica.com.

e. Hettich America, LP: www.hettich.com/#sle.

f. Hafele America Co.

g. Knape & Vogt Manufacturing Company; Light-Duty Drawer Slides: www.knapeandvogt.com/#sle.

h. Knape & Vogt Manufacturing Company; Medium-Duty Drawer Slides: www.knapeandvogt.com/#sle.

i. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.

j. Or Equal 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. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.09 SITE FINISHING MATERIALS

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

2.10 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. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.11 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.

B. Verify location and sizes of utility rough-in associated with work of this section.

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 (WI (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 (WI (CSIP)), including:

(a) A CSIP Certificate indicating that all of the casework installation fully meets the requirements of the AWMAC/WI (NAAWS) and WI (CSIP).

3) It is the responsibility of the installer to include within their bid, any and all costs for WI (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 WI (CSIP). 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 07 01 50.20
ROOFING, RESTORATION, PATCH, AND REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Partial removal of existing roofing system in preparation for new penetrations.

B. Patching and repair shall not void or reduce Contractor's and manufacturer's warranty of existing roofing. If possible, removal of existing roofing and repair is receommended to be done by the Roofing Contractor in which the roofing system was originally installed.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Wood framing, plywood sheathing, wood curbs, cants, nailers, blocking and backing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets, .

C. Division 22 - Plumbing: Roof drains, plumbing items penetrating roofing membrane.

D. Division 26 - Electrical.

1. Conduit penetrating roofing membrane.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene two weeks before starting work of this section.

1. Attendance is mandatory at conference required in section specifying new roofing installation.
    a. Require attendance by Contractor's superintendent and other supervisory and quality control personnel having responsibility for roofing, supervisory personnel of roofing installer and, if required for warranty provisions, representative of roofing products manufacturer.
    b. DSA, testing and inspection agency (if engaged by District), District's insurance underwriter (if necessary, at District's option), and Architect (if authorized by District) will attend.
    c. At Contractor's option, installers of each component of related Work, including deck or substrate construction, rooftop equipment, penetrations of roof deck, and other Work integral with or adjacent to roofing may attend.
    d. If required, attendance shall include Authority Having Jurisdiction (AHJ). Contractor shall verify requirement with Authority Having Jurisdiction (AHJ) and arrange for attendance.
2. Establish at pre-bid job walk, number of layers to be removed and reconfirm at pre-installation conference.
3. See new roofing installation section for additional information.

4. Agenda items specific to patch and repair.
    a. Review Drawings and Specifications for suitability for application of roofing system. Review application procedures and coordination required with related Work.
        1) Discuss changes and deviations from Drawings and Specifications, if any, recommended or required.
    b. Walk roof areas to review and discuss substrate preparation including repair of unacceptable surfaces, roof drainage, penetrations, equipment curbs, and work performed by other trades which requires coordination with roofing system.
    c. Review Contract Document requirements and submittals for roofing system, including roofing schedule, inspection and testing, and environmental conditions.
        1) Identify which governing regulations or insurance requirements will affect roofing system installation.
    d. Discuss anticipated weather, as well as procedures for responding to unacceptable weather, including using temporary roofing.
        1) Temporary roofing, if necessary, will be added to scope of the Work by contract modification (change order or construction change directive), with acceptable adjustment in Contract Time and Contract Sum.
    e. Document discussions in writing, including actions required, and distribute copy of report to each meeting participant.
    f. Attendance by DSA, Architect and independent testing and inspection agency shall not relieve Contractor of sole responsibility for means, methods, techniques and sequence of construction, in accordance with provisions of the Bidding and Contract Requirements.

C. Schedule work to coincide with commencement of installation of new roofing system.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit for each type of material.

C. Shop Drawings: Indicate size, configuration, and installation details.

D. Preconstruction Test Reports.

E. Materials Removal Company Qualification Statement.

F. Installer's Qualification Statement.

G. Preconstruction Testing Agency Qualification Statement.

H. Certification required for existing buildings to be re-roofed per Chapter 3 of Part 1 of Division 2 of the Public Contract Code Section 1 Section 3006(b):

1. I, _____ (Name), _____ (Name of Employer), certify that I have not offered, given, or agreed to give, received, accepted, or agreed to accept, any gift, contribution, or any financial incentive whatsoever to or from any person in connection with the roof project contract. As used in this certification, "person" means any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals. Furthermore, I _____ (Name), _____ (Name of Employer), certify that I do not have, and throughout the duration of the contract, I will not have, any financial relationship in connection with the performance of this contract with any architect, engineer, roofing consultant, materials manufacturer, distributor, or vendor that is not disclosed below.
2. I _____ (Name), _____ (Name of Employer), have the following financial relationships with an architect, engineer, roofing consultant, materials manufacturer, distributor, or vendor, or other person in connection with the following roof project contract:

   _____

   Name and Address of Building, Contract Date and Number
3. I certify that to the best of my knowledge, the contents of this disclosure are true, or are believed to be true.

   _____ (Signature) _____ (Date)

   _____ (Print Name)

   _____ (Print Name of Employer)
4. Submit this certification to District, DSA, and Architect.

1.05 QUALITY ASSURANCE

A. Comply with Title 24 Part 2 - California Building Code Sections 1504 Performance Requirements, 1505 Fire Classification and 1507 Requirements for Roof Coverings; and Part 6 - California Energy Code requirements

B. Materials Removal Firm Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.

C. Industry Standards:
   1. Work specified in this Section shall comply to manufacturer's product data and application instructions.
   2. Work shall also conform to recommended practices and details published in NRCA Roofing and Waterproofing Manual, NRCA ML104 and recommended practices and details of Western States Roofing Contractors Association (WSRCA), where such practices and details are more stringent.

D. Testing and Inspection:
   1. At District's option, services of an independent inspection and testing agency may be obtained. Costs of this service will be paid for by District.
   2. Contractor shall cooperate with independent testing and inspection agency.

1.06 SCHEDULING

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

1.07 FIELD CONDITIONS

A. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

B. Maintain continuous temporary protection prior to and during installation of new roofing system.

1.08 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces affected by reroofing, by methods and with materials acceptable to warrantor.

1. Notify warrantor of existing roofing system before proceeding, and upon completion of reroofing.

2. Obtain documentation verifying that existing roofing system has been inspected by manufacturer's technical representative, warrantor, and warranty remains in effect. Submit documentation at Project closeout.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Roofing Assembly Requirements:

1. External Fire Exposure Classification: ASTM E108 Class A, UL (DIR) or Warnock Hersey listed.

B. Indicated Roof Areas: Patch and repair existing roofing, perimeter flashings, base flashings, counter flashings, vent stack flashings, roofing membrane, and insulation where required for the installation of new roof mounted equipment.

C. Patch and repair roofing as necessary to provide complete, weathertight installation conforming to referenced industry standards and as necessary to accommodate new Work.

D. Contract Drawings and Specifications:

1. Contract Drawings and Specifications are diagrammatic and of a general nature only.

2. Materials manufacturer's specifications for roofing and related flashings shall govern Work as if set forth herein, except as specifically indicated or where more stringent requirements are specified or required by Authority Having Jurisdiction (AHJ).

3. All Work shall be completed as required to obtain specified warranty and guarantee.

E. Design Review:

1. Contractor, roofing installer and manufacturer's representative of the original roofing installation (if known or or identifiable) shall review Drawings and Specifications.

2. Obtain confirmation from roofing installer and manufacturer of original roofing (if known or identifiable) that selected roofing materials for patching and repair are proper, compatible and adequate for the Project and that conditions and details indicated and specified do not conflict with requirements and recommendations of manufacturer.

2.02 MATERIALS

A. Temporary Protection: Sheet polyethylene; provide weights to retain sheeting in position.
   1. Provide thickness sufficient to prevent tearing or damage during use.

B. Protection Board: ASTM C208 cellulose fiber board, one face finished with mineral fiber, asphalt and kraft paper.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing site conditions.

B. Verify that existing roof surface is clear and ready for work of this section.
   1. Verify that roof deck is structurally sound to support live and dead load requirements of roofing system and sufficiently rigid to support construction traffic.

3.02 PREPARATION

A. Coordination: Coordinate patching and repairs of roofing with installation of penetrations, supports and other adjoining new construction which affects existing roofing.

B. Deck Preparation:
   1. Clean and prepare roof deck in accordance with roofing system manufacturer's instructions and recommendations.
   2. Correct substrate surfaces which are unacceptable to installer.

C. Sweep roof surface clean of loose matter.

D. Remove loose refuse and dispose off site.
   1. Free Fall Maximum: 8 feet, provide enclosed chutes for higher fall.
   2. Do not use District's disposal system.

E. Deck Condition: Firm, smooth, clean and sufficiently dry to suit roofing manufacturer's requirements.
   1. Conduct moisture test of deck and surrounding roofing.
   2. Do not proceed with roofing application until deck and surrounding materials are dry.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove metal counter flashings.

C. Remove damaged portions of roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.

D. Cut and lay flat any membrane blisters.

E. Remove damaged insulation and fasteners, cant strips, blocking .

F. Remove sheathing paper and underlay..

G. Repair existing underlying deck surface to provide smooth working surface for new roof system.

3.04 TEMPORARY PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected or repaired deck surface.

3.05 PATCHING AND REPAIRS

A. General:

1. It is intended to leave existing roofing intact as much as feasible.
    a. Roofing Work is intended to be patching and repair of portions of existing roofing due to new:
        1) Structural supports.
        2) Penetrations.
        3) Heating, ventilating and air conditioning (HVAC) equipment.
        4) Electrical system penetrations.
    b. Include repairs of areas damaged as result of construction activities.
2. Comply with instructions and recommendations of manufacturer of existing roofing system for making patches and repairs.
3. Comply also with recommended practices of referenced industry standards.
4. Protect other Work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace and restore other construction damaged or degraded by roofing Work.
5. Apply roofing materials in accordance with NRCA Roofing and Waterproofing Manual and published details and recommendations of Western States Roofing Contractors Association (WSRCA).
6. Keep roofing materials dry before and during application. Do not permit phased construction.

B. Flashing Replacement: Entire sheet of flashing membrane is to be adhered to vertical substrate and hot-air welded to the secured field membrane.

C. Penetrations:

1. Coordinate roofing Work with plumbing, mechanical and electrical Work and other Work involving penetrations of roofing membrane.

2. Provide pipe and conduit penetrations as indicated on Drawings, or if more stringent, as detailed in NRCA - Roofing and Waterproofing Manual.
3. Verify that penetrations through roof are adequately separated by a minimum of 18 inches from each other, away from curbs, platforms, sleepers and walls and are also located a minimum of 24 inches beyond all waterways.

D. Other Roofing Accessories: Install other accessories in accordance with manufacturer's instructions and recommendations, and NRCA Construction Details, as applicable.

E. Crickets and Tapered Areas: Install to provide positive slope at proper transitions at changes in roof plane.

F. Flashing and Sheet Metal Work: Set and flash in integrated sheet metal.

3.06 FIELD QUALITY CONTROL

A. Independent agency inspection and testing will be provided under provisions of Section 01 40 00.

B. The drawings identify the approximate limits to material removal.

C. Testing will identify the condition of existing materials and their reuse, repair or removal.

D. Test Reports: Indicate existing insulation moisture content and existing roof system quality.

3.07 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected or repaired deck surface.

3.08 SCHEDULES

A. Roof Areas as Indicated: Remove, where required, existing perimeter flashings, base flashings, counter flashings, vent stack flashings, roofing membrane, and insulation.

B. Remove indicated roof mounted mechanical equipment and electrical equipment.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation in exterior wall construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

C. Batt insulation for acoustic applications in interior walls.

1.02 RELATED REQUIREMENTS

A. Section 07 27 00 - Air Barriers: Separate air barrier materials.

B. Section 075216: Installation requirements for board insulation over low slope roof deck.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.

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 in Metal Framed Walls: Batt insulation with no vapor retarder.

B. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

C. Acoustic Insulation in Wood Framed Interior Walls: Batt insulation with no vapor retarder.

D. Insulation in Wood Framed Ceiling Structure: Batt insulation with no vapor retarder.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, 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: Each R-value of 15.
    b. Thickness: Each 3-1/2 inch.
6. Facing: Unfaced.
7. 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.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.

1. Typical at interior walls, see section 09 21 16 - Gypsum Board Assemblies.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
4. Products:
    a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
    b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Wire Mesh: Galvanized steel, hexagonal wire mesh.

B. 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 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids.

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.

3.03 FIELD QUALITY CONTROL

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

3.04 PROTECTION

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

END OF SECTION

SECTION 07 42 13.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup. ACP-1

B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Panel support framing.

B. Section 07 25 00 - Weather Barriers: Water-resistive barrier behind wall panel system.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

D. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

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 A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

K. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

L. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.

M. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

P. CBC - California Building Code.

Q. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

1. Require attendance by the installer and relevant sub-contractors.
2. Include MCM sheet manufacturer’s representative and wall system manufacturer’s representative to review storage and handling procedures.
3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
4. Review procedures for protection of work and other construction.
5. Review safety precautions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:

1. Finish manufacturer's data sheet showing physical and performance characteristics.
2. Storage and handling requirements and recommendations.
3. Fabrication instructions and recommendations.
4. Specimen warranty for finish, as specified herein.

C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.
2. Storage and handling requirements and recommendations.
3. Installation instructions and recommendations.
4. Specimen warranty for wall system, as specified herein.

D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.

1. Indicate panel numbering system.

2. Differentiate between shop and field fabrication.
3. Indicate substrates and adjacent work with which the wall system must be coordinated.
4. Include large-scale details of anchorages and connecting elements.
5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.

E. Selection Samples: For each finish product specified, submit at least three sample color chips representing manufacturer's standard range of available colors and patterns.
1. Sealant Color: Color as selected by Architect.

F. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.

G. Certificate: Certify that the work results of this section meet or exceed specified requirements.

H. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

I. Test Report: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

J. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.

K. Manufacturer's qualification statement.

L. Installer's qualification statement.

M. Testing agency's qualification statement.

N. Maintenance Data: Care of finishes and warranty requirements.

O. Executed Warranty: Submit warranty and ensure that forms have been completed in District's name and registered with manufacturer.

P. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in District's name and registered with installer.

1.06 QUALITY ASSURANCE

A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.

B. Manufacturer Qualifications: Company specializing in manufacturing wall panel systems specified in this section.
1. With not less than three years of documented experience.
2. Approved by MCM sheet manufacturer.
3. Submit contact names and phone numbers for at least three references connected with successful past projects.

C. Installer Qualifications: Company specializing in performing work of type specified in this section.

1. With minimum three years of documented experience.
2. Approved by wall panel system manufacturer.
3. Submit contact names and phone numbers for at least three references connected with successful past projects.

D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

1.07 MOCK-UPS

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

B. Provide a mock-up for evaluation of fabrication workmanship.

C. Locate where directed.

D. Provide specified finish on panels.

E. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Protect finishes by applying heavy-duty removable plastic film during production.
2. Package for protection against transportation damage.
3. Provide markings to identify components consistently with drawings.
4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.

C. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Store in well-ventilated space out of direct sunlight.
2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
3. Store at a slope to ensure positive drainage of accumulated water.
4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.09 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 WARRANTY

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

B. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of wall panels. Complete forms in District's name and register with warrantor.

C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in District's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material (MCM) Sheet Manufacturers:

1. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS: www.alucobondusa.com/#sle.
2. Arconic Architectural Products, Inc; Reynobond Aluminum Composite Material (ACM): www.alcoa.com/#sle.
3. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): www.alpolic-americas.com/#sle.
4. Citadel Architectural Products, Inc; Envelope 2000: www.citadelap.com/#sle.
5. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Panel System Manufacturers:

1. ACP-1 Basis of Design Product: Alucobond Rout and Return Wet Seal as manufactured by 3A Composites USA, or approved equal.
2. 3A Composites USA; Rout and Return Wet-Seal: www.alucobondusa.com, or approved equal.
    a. ICC ESR-1185, Alucobond Plus,. 40 ft. and above.
3. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): www.alpolic-americas.com/#sle.
    a. ICC ESR-2653, FR core. 40 ft. and above.
4. Arconic Architectural Products, Inc; Reynobond Aluminum Composite Material (ACM): www.alcoa.com/#sle.
    a. ICC ESR-3435. 40 ft. and above.
5. Citadel Architectural Products, Inc; Envelope 2000 Rout and Return (RR) System: www.citadelap.com/#sle.
    a. ICC ESR-1015. up to 40 ft. and above
6. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
7. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.

1. Provide panel jointing and weatherseal using a "wet", sealant-sealed system.
2. Anchor panels to supporting framing without exposed fasteners.

B. Provide labeling to conform to CBC 1406.13 and 1703.5.

2.03 PERFORMANCE REQUIREMENTS

A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

1. Design Wind Pressure: As specified in CBC/ASCE 7. See Wind Project Design Criteria on S0-1.1.

B. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.27 psf minimum, after 15 minutes.

1. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
2. Design to drain leakage and condensation to the exterior face of the wall.

C. Fire Performance: Use test method complying with NFPA 285.

2.04 PANELS

A. Panels: 1 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.

1. Reinforce corners with riveted aluminum angles.
2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
4. Reinforce panels over 36 inches long with metal angle braces 24 inches on center in short direction.
5. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
6. Metallic Finished Panels: Maintain consistent grain of MCM sheet; specifically, do not rotate sheet purely to avoid waste.
7. Fabricate panels under controlled shop conditions.

8. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
9. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
    a. Make panel lines, breaks, curves, and angles sharp and true.
    b. Keep plane surfaces free from warp or buckle.
    c. Keep panel surfaces free of scratches or marks caused during fabrication.
10. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

2.05 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
    1. Overall Sheet Thickness: 0.157 inch, minimum.
        a. Unless indicated otherwise on Drawings.
    2. Face Sheet Thickness: 0.019 inch, minimum.
    3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
    4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
    5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84. CBC 1406.10.1.
    6. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.
B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
    1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
    2. Stainless Steel Sheet Components: ASTM A480/A480M.
    3. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).
C. Panel Support Framing: See Section 06 10 00 - Rough Carpentry for additional requirements.

2.06 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as indicated on drawings.
    1. Products:

a. PPG; Duranar: www.ppgmetalcoatings.com/#sle.

b. Sherwin-Williams Company; Fluropon: www.coil.sherwin.com/#sle.

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

B. Color/Texture: As selected by Architect from manufacturer's full range.

2.07 ACCESSORIES

A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; see Section 07 62 00 for additional requirements.

B. Support for Cladding and Continuous Insulation: Thermal clips.

1. Thermally-broken clips that provide attachment support for girts, angles, channels, and other cladding support framing.

2. Fasteners: As recommended by clip manufacturer.

C. Anchors, Clips, and Accessories: Use one of the following:

1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.

2. Steel complying with ASTM A36/A36M and hot-dip zinc coating to ASTM A153/A153M.

3. Steel complying with ASTM A36/A36M and hot-dip galvanized to ASTM A123/A123M, with Coating Thickness Grade of 100.

D. Fasteners:

1. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.

2. Bolts: Stainless steel.

3. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

E. Joint Sealer: Provide color as selected by Architect silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.

1. See Section 07 92 00 for additional requirements.

F. Provide panel system manufacturer's and installer’s standard corrosion resistant accessories, including fasteners, clips, anchorage devices, and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.

1. Verify that weather barrier system is properly installed; see Section 07 25 00 for requirements.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

1. Inspect framing that will support composite wall panel system to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to composite wall panel system manufacturer.
    a. Maximum deviations acceptable to composite wall panel system manufacturer:
        1) 1/4 inch in 20 feet vertically or horizontally from face plane of framing.
        2) 1/2 inch maximum deviation from flat substrate on any building elevation.
        3) 1/8 inch in 5 feet.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
    1. Correct out-of-tolerance work and other deficient conditions prior to proceeding with composite wall panel system installation.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Accessories: Install all components required for a complete assembly, including flashings, gutters, trim, moldings, closure strips, preformed crickets, closures, and similar accessory items.

D. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

E. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

F. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

G. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

H. Where joints are designed for field-applied sealant, seal joints completely with specified sealant.

I. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

J. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:

1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

K. Replace damaged products.

1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 FIELD QUALITY CONTROL

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

B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

C. Site Visits: Schedule two site visits during execution of installation.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

C. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

D. Remove temporary coverings and protection of adjacent work areas.

E. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed panel system from damage until Date of Final Inspection.

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. SM-1

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Flexible flashing.

B. Division 7 - Thermal and Moisture Protection: Roofing system.

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 andInstaller Qualifications: Company specializing in sheet metal work with five years ofdocumented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. 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.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect from manufacturer's custom colors.

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 FLASHING

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 sheathing paper.

E. Primer Type: Zinc chromate.

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. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

I. Solder: ASTM B32, Alloy Grade - Sn50 (50/50).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 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, 0.015 inch.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

F. Metal Flashing at Wall and Roof Penetrations and Equipment Supports:

1. Exception:
    a. Roofing: Where single ply system assembly has provided flashing for penetrations.
2. Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck or walls.
    a. Goose-necks, rainhoods, power roof ventilators, and other plumbing, HVAC and electrical products are specified as appropriate in:
        1) Division 21 - Fire Suppression.
        2) Division 22 - Plumbing.
        3) Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC).
        4) Division 26 - Electrical.
    b. Coordinate also with sheet metal curbs specified in Section 07 72 00.
3. Single Pipe Vents: Provide lead flashing as indicated on Drawings.
    a. Set flange of sleeve in bituminous plastic cement and nail 3 inches on centers.
    b. Bend the top of sleeve over and extend down into the vent pipe a minimum of 2 inches.
    c. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed galvanized sheet metal housing.
    d. Set metal housing with a metal sleeve having a 4 inch roof flange in bituminous plastic cement and nailed 3 inches on center.
    e. Extend sleeve a minimum of 8 inches above the roof deck and lapped a minimum of 3 inches by a metal hood secured to the vent pipe by a draw band.
    f. Seal the area of hood in contact with vent pipe with specified sealant. Sealants are specified in Section 07 92 00 - Joint Sealants.
4. Roof Penetration Flashing:
    a. Base Flashing:
        1) Extend flange onto roof 6 inches minimum away from penetration.
        2) Extend flange upward around penetration to at least 8 inches above roofing felts.
        3) Fold back upper and side roof flange edges 1/2 inch minimum.
        4) Lap and solder joints.
    b. Counterflashing: Overlap base flashing 1 inch minimum with storm collar sloped away from penetration. Secure to penetration with draw band and sealant.
5. Equipment Support and Pad Flashing:
    a. Fully cap support and pad.
    b. Overlap base flashing 4 inches.

c. Lap and solder joints.

d. Provide sealant around penetrations through-flashing.

3.04 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.

3.05 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.

3.06 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 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

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

B. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

C. Section 07 05 53 - Fire and Smoke Assembly Identification.

D. Section 07 81 00 - Applied Fire Protection.

E. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.

G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

H. CBC - California Building Code.

I. ITS (DIR) - Directory of Listed Products.

J. FM 4991 - Approval Standard of Firestop Contractors.

K. FM (AG) - FM Approval Guide.

L. Firestop Contractors International Association (FCIA): M.O.P. Manual of Practice.

M. International Firestop Council (IFC); www.firestop.org:

1. Reference 1: Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments.
2. Reference 2: Inspectors Pocket Guide; Fifth Edition.

N. SCAQMD 1168 - Adhesive and Sealant Applications.

O. UL 1479 - Standard for Fire Tests of Penetration Firestops.

P. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

Q. UL (FRD) - Fire Resistance Directory.

R. UL 263 - Standard for Fire Tests of Building Construction and Materials.

S. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Certificate from authority having jurisdiction indicating approval of materials used.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Provide products for all trades from the same manufacturer to the greatest extent possible and from the same supplier/distributor.

B. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1. One firestop manufacturer shall be used for the entirety of applications on this project unless otherwise approved by the Architect. The manufacturer will be required to furnish UL tested systems for all applications pertaining to the project, and other relevant information.

a. Materials of different manufacture than allowed by the tested and listed system shall not be intermixed in the same firestop system or opening.

b. Tested and listed firestop systems are to be used before an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) is installed.

2. A manufacturer's knowledgeable direct representative (manufacturer authorized; distributor, independent representative, manufacturer's representative, or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

D. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.
   2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
      a. UL Qualified Firestop Contractor
      b. Verification of minimum three years documented experience installing work of this type.
      c. Shown to have successfully completed not less than 5 comparable scale projects.
      d. Verification of at least five satisfactorily completed projects of comparable size and type.
      e. Firestop Contractors International Association Contractor Member in good standing.
      f. Licensed by local authorities having jurisdiction (AHJ).

1.06 SEQUENCING AND SCHEDULING

A. Project coordination is essential to inform and educate all the parties involved with the firestopping process of their role and how they can affect firestopping on the project. A pre-construction meeting shall be scheduled and required for all parties involved prior to the start of construction.

B. Do not cover up firestopping installations until District's inspection agency or the Authorities Having Jurisdiction have examined each installation.

1.07 MOCK-UPS

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

B. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install at least 1 linear foot of firestopping.

C. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.

D. If accepted, mock-up will represent minimum standard for this work.

E. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.08 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Firestop System installation must meet requirements of ASTM E814, ASTM E2307, ASTM E1966, UL 263, UL 723, and UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

1. Positive pressure in accordance with California Building Code (CBC) for ratings. Reference: CBC Section 714.4.1.2.
2. Comply with UL 2079 for top of wall assemblies.
3. Conform to CBC Section 714.4.1.1 and 714.4.2.

B. For those firestop applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

2.02 MANUFACTURERS

A. Firestopping Manufacturers:

1. Basis of Design: Specified Technologies, Inc: www.stifirestop.com/#sle.
2. 3M Fire Protection Products: www.3m.com/firestop/#sle.
3. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
4. Hilti, Inc: www.us.hilti.com/#sle.
5. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
6. Rectorseal; Bio FireShield and Metacaulk Systems: www.rectorseal.com.
7. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
8. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Fire Ratings: Refer to drawings for required systems and ratings.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

a. UL runs ASTM E814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually with a midyear supplement.

1) Through-Penetration Firestop Devices (XHCR).

2) Fire Resistance Ratings (BXUV).

3) Through-Penetration Firestop Systems (XHEZ).

4) Fill, Voids, or Cavity Material (XHHW).

5) Forming Materials (XHKU).

6) (XHBO)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

B. Pre-Installation Inspection: Inspect all fire and smoke barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping; or 3) smokestopping.

1. Conduct inspection prior to covering up or enclosing walls or ceilings.

2. Conduct inspection jointly with authorized representative of authority having jurisdiction.

C. If the configuration of a particular penetration does not conform to the configuration necessary for the required firestopping assembly:

1. Notify the installer of the penetration for modification of the configuration to suit the assembly.

2. Do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authority having jurisdiction.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

D. Priming:

1. Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods.
2. Confine primers to areas of bond.
3. Do not allow spillage and migration onto exposed surfaces.

E. Masking:

1. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work.
2. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.

F. Verify that system components are clean, dry, and ready for installation.

G. Verify that field dimensions are as shown on the Drawings and as recommended by the manufacturer.

H. Prepare penetrations in accordance with the material manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

1. Provide all accessory materials.

B. Firestop Joint Systems:

1. Install joint fillers to provide support of firestop materials during application and at the position required to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
2. Install systems by proven techniques that result in firestop materials:
    a. Directly contacting and fully wetting joint substrates.
    b. Completely filling recesses provided for each joint configuration,
    c. Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability.
3. Tool non-sag firestop materials immediately after their application and prior to the time skinning or begins. Form smooth, uniform beads of configuration indicated or required.
    a. Produce fire-resistance rating
    b. To eliminate air pockets
    c. To ensure contact and adhesion with sides of joint.

C. Penetration Firestops:

1. Coordinate with other trades to assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.

2. Schedule the work to assure that partitions and all other construction that conceals penetrations are not erected prior to the installation of firestop and smoke seals.
3. Install forming/damming materials and other accessories in accordance with manufacturers written instructions.
4. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
    a. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
    b. Install materials so they contact and adhere to substrates formed by openings and penetrating items.
5. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces

D. Remove combustible forming materials, unless they are a required component of the tested assembly.

E. Do not cover installed firestopping until inspected by District's Independent Testing Agency.

F. Do not cover installed firestopping until inspected by authorities having jurisdiction.

G. Install labeling required by code; Section 07 05 53 - Fire and Smoke Assembly Identification.
1. Near fire and smoke barriers, mark each exposed penetration with label identifying it as a fire-stopped or smoke-stopped assembly.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by District, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
1. Inspection agency to examine firestopping and will determine, in general, that firestopping has been installed in compliance with requirements of tested and listed firestop system, and installation process conforms to FM 4991 - Standard for Approval of Firestop Contractors or UL Qualified Firestop Contractor Program.
2. The inspector shall advise the Contractor of any deficiencies noted within one (1) working day.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

C. Do not proceed to enclose firestopping with other construction until inspection agency has verified that the firestop installation complies with the requirements.

D. Submit report of inspection to the DSA and Architect.

3.05 CLEANING

A. Hazardous disposal of firestop materials shall be strictly observed as noted on the individual MSDS.

B. Clean adjacent surfaces of firestopping materials.
1. Clean up excess material adjacent to penetrations promptly; use methods and materials approved by the manufacturers of the penetration seals and of surfaces to be cleaned.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

B. Protect firestopping during and after curing period from contact with contaminating substances.

C. Protect installed Work from damage from construction operations using substantial barriers as necessary.

D. Repair damaged materials in accordance with manufacturer's instructions.

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 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

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 C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

H. ASTM C1311 - Standard Specification for Solvent Release Sealants.

I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

J. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

K. SCAQMD 1168 - Adhesive and Sealant Applications.

L. SWRI (VAL) - SWR Institute Validated Products Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include 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. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.
6. Substrates for which use of primer is required.
7. Substrates for which laboratory adhesion and/or compatibility testing is required.
8. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
9. Sample product warranty.
10. Certification by manufacturer indicating that product complies with specification requirements.
11. 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. Manufacturer's qualification statement.

N. Installer's qualification statement.

O. Executed warranty.

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 sufficient samples to manufacturer 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 acknowledgment 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 no primer is 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 manufacturer's 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. Nondestructive 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 sealant joints.

a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1,000 linear feet, and one test per 1,000 linear feet thereafter, or once per floor on each elevation.

b. If any failures occur in the first 1,000 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. Nondestructive 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 before minimum elongation, take necessary measures to correct conditions and retest; 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 another applicable method as recommended by manufacturer.

1.06 WARRANTY

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

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in District's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:

1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. Bostik Inc: www.bostik-us.com/#sle.
3. Dow: www.dow.com/#sle.
4. Franklin International, Inc: www.titebond.com/#sle.
5. Henry Company: www.henry.com/#sle.
6. Hilti, Inc: www.hilti.com/#sle.
7. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
8. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
9. Pecora Corporation: www.pecora.com/#sle.
10. QUIKRETE Companies: www.quikrete.com/#sle.
11. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
12. Sika Corporation: www.usa.sika.com/#sle.
13. Specified Technologies Inc: www.stifirestop.com/#sle.
14. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
15. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
16. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants:

1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. Bostik Inc: www.bostik-us.com/#sle.
3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
4. Dow: www.dow.com/#sle.

5. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
6. Pecora Corporation: www.pecora.com/#sle.
7. QUIKRETE Companies: www.quikrete.com/#sle.
8. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
9. Sika Corporation: www.usa.sika.com/#sle.
10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
11. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
12. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      a. Do not seal exterior joints unless indicated on drawings as sealed.
      b. Seal open joints except open joints indicated on drawings as not sealed.
   2. Interior Joints:
      a. Do not seal interior joints indicated on drawings as not sealed.
      b. Do not seal gaps and openings in gypsum board and suspended ceilings
      c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
      d. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
         2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
         3) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
   3. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.
B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
   1. Type SM-1 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
   2. Type SM-1 - Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
   3. Type CP-1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

4. Type IA-1 - Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
5. Type WP-1 - Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
6. Type WP-1 - Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.
7. Type FS-1 - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
    a. See Section 09 30 00 for sealing between tile and plumbing fixtures.

C. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

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 drawings.

2.04 NONSAG JOINT SEALANTS

A. Type NS-1 - Nonstaining 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. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: Match adjacent finished surfaces.
6. Service Temperature Range: Minus 20 to 180 degrees F.
7. Products:
    a. Dow; DOWSIL 756 SMS Building Sealant: www.dow.com/#sle.
    b. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
    c. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/#sle.
    d. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.
    e. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.
    f. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/#sle.
    g. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com/#sle.
    h. Sika Corporation; Sikasil WS-290: www.usa.sika.com/#sle.

i. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.

j. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.

k. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.

l. Tremco Commercial Sealants & Waterproofing; Spectrem 2: www.tremcosealants.com/#sle.

m. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.

n. Tremco Commercial Sealants & Waterproofing; Spectrem 4-TS: www.tremcosealants.com/#sle.

o. Tremco Commercial Sealants & Waterproofing; Tremsil 200: www.tremcosealants.com/#sle.

p. Tremco Commercial Sealants & Waterproofing; Tremsil 400: www.tremcosealants.com/#sle.

q. Or Equal 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. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.

3. Color: To be selected by Architect from manufacturer's standard range.

4. Cure Type: Single component, neutral moisture curing.

5. Service Temperature Range: Minus 65 to 180 degrees F.

6. Products:

a. Dow; DOWSIL 999-A Building and Glazing Sealant: www.dow.com/#sle.

b. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.

c. Henry Company; Moistop Sealant: www.henry.com/#sle.

d. Momentive Performance Materials, Inc/GE Silicones; SCS2000 SilPruf - Silicone Sealant and Adhesive: www.siliconeforbuilding.com/#sle.

e. Momentive Performance Materials, Inc/GE Silicones; SCS2700 SilPruf LM (Low Modulus) - Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.

f. Momentive Performance Materials, Inc/GE Silicones; SSG4600 UltraGlaze - Silicone Structural Glazing Adhesive: www.siliconeforbuilding.com/#sle.

g. Pecora Corporation; Pecora 860: www.pecora.com/#sle.

h. Pecora Corporation; Pecora 890FTS (Field Tintable Smooth): www.pecora.com/#sle.

i. Pecora Corporation; Pecora 890FTS-TXTR (Field Tintable Textured): www.pecora.com/#sle.

j. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant: www.sherwin-williams.com/#sle.

k. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.

l. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.

m. Sika Corporation; Sikasil N-Plus US: www.usa.sika.com/#sle.

n. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.

o. Or Equal 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. Products:

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. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. Type ST-1 - Hybrid Elastomeric 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 50 percent, minimum.

2. Hardness Range: 15 to 25, 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 75 to 300 degrees F.

5. Products:

a. Dow; DOWSIL Contractors Paintable Sealant - CPS: www.dow.com/#sle.

b. Franklin International Inc; Titebond WeatherMaster Sealant: www.titebond.com/#sle.

c. Master Builders Solutions; MasterSeal NP100: www.master-builders-solutions.com/en-us/#sle.

d. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant: www.sherwin-williams.com/#sle.

e. Sherwin-Williams Company; Stampede 1H Hybrid Sealant: www.sherwin-williams.com/#sle.

f. Tremco Commercial Sealants and Waterproofing; Dymonic FC: www.tremcosealants.com/#sle.

g. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

6. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
7. Color: To be selected by Architect from manufacturer's full range.
8. Service Temperature Range: Minus 40 to 180 degrees F.
9. Products:
    a. Master Builders Solutions; MasterSeal NP1: www.master-builders-solutions.com/en-us/#sle.
    b. Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
    c. Pecora Corporation; DynaFlex: www.pecora.com/#sle.
    d. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.
    e. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.
    f. Sika Corporation; Sikaflex-15 LM: www.usa.sika.com/#sle.
    g. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
    h. Tremco Commercial Sealants & Waterproofing; Vulkem 116: www.tremcosealants.com/#sle.
    i. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
    j. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. Type WP-1 - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; 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 standard range.
    4. Service Temperature Range: Minus 40 to 180 degrees F.
    5. Products:
        a. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.
        b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

F. Nonsag 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: 20 to 30, Shore A, when tested in accordance with ASTM C661.
    3. Color: Match adjacent finished surfaces.

G. Polysulfide 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 25 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 standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
    a. Pecora Corporation: www.pecora.com/#sle.
    b. W. R. Meadows, Inc; Deck-O-Seal Gun Grade: www.wrmeadows.com/#sle.
    c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

H. Type IA-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's full range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:
    a. Franklin International, Inc; Titebond Pro-Grade Plus Caulk: www.titebond.com/#sle.
    b. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
    c. Hilti, Inc; CP 572 Smoke and Acoustical Spray Sealant: www.us.hilti.com/#sle.
    d. Hilti, Inc; Lightweight Smoke and Acoustic Sealant CS-S SA Light: www.us.hilti.com/#sle.
    e. OSI Greenseries SC-175 Draft & Acoustical Sound Sealant; www.ositough.com.
    f. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
    g. Sherwin-Williams Company; White Lightning 3006 Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
    h. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
    i. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
    j. Sherwin-Williams Company; Bolt Quickdry Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
    k. Sherwin-Williams Company; Powerhouse Siliconized Acrylic Latex Sealant: www.sherwin-williams.com/#sle.
    l. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant: www.stifirestop.com/#sle.
    m. Top Gun, a brand of PPG Architectural Coatings; Top Gun 200: www.ppgpaints.com/#sle.
    n. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
    o. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke and Sound: www.tremcosealants.com/#sle.
    p. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke and Sound Spray: www.tremcosealants.com/#sle.

q. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.05 SELF-LEVELING JOINT 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 standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
   a. Dow; DOWSIL SL Parking Structure Sealant: www.dow.com/#sle.
   b. Pecora Corporation; Pecora 300 SL (Self-Leveling): www.pecora.com/#sle.
   c. Pecora Corporation; Pecora 322 FC (Fast Cure): www.pecora.com/#sle.
   d. Sika Corporation; Sikasil 728SL: www.usa.sika.com/#sle.
   e. Tremco Commercial Sealants & Waterproofing; Spectrem 900SL: www.tremcosealants.com/#sle.
   f. Or Equal 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 multicomponent; 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 standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
   a. Pecora Corporation: www.pecora.com/#sle.
   b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
   c. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.

C. Type WFP-1 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single 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 standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:

a. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.

b. W. R. Meadows, Inc; POURTHANE SL: www.wrmeadows.com/#sle.

c. Or Equal 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 standard range.

4. Service Temperature Range: Minus 40 to 180 degrees F.

5. Products:

a. W. R. Meadows, Inc; Deck-O-Seal (pourable): www.wrmeadows.com/#sle.

b. Or Equal 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. Products:

a. ARDEX Engineered Cements; ARDEX ARDIFIX: www.ardexamericas.com/#sle.

b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

F. Type EPX-1 - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Composition: Multicomponent, 100 percent solids by weight.

2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.

3. Color: Concrete gray.

4. Joint Width, Minimum: 1/8 inch.

5. Joint Width, Maximum: 1/4 inch.

6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.

7. Products:

a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

b. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.

c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

G. 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 Width, Maximum: 1/2 inch.
5. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.
6. Products:
    a. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: www.ardexamericas.com/#sle.
    b. Euclid Chemical Company; EUCO QWIKjoint UVR: www.euclidchemical.com/#sle.
    c. Nox-Crete Inc; DynaFlex JF-85: www.nox-crete.com/#sle.
    d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

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, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

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. 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 other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
6. After completion of tests, remove remaining sample material and prepare joints 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.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. 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.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. 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.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

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

B. District will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.

D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

F. 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 them.

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 - Exit Devices.

C. BHMA A156.5 - Cylinders and Input Devices for Locks.

D. BHMA A156.13 - Mortise Locks & Latches Series 1000.

E. BHMA A156.18 - 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. B/O, 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. Do not order hardware 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. Verify all door quantities with the Architectural Drawings.

F. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

G. Kick down hold opens at all existing openings need to be removed.

H. GC to adjust all existing closers to ensure proper function. Any closers that are not in good working condition, and/or the hold open option is not working, should be replaced with *LCN 4040XP HEDA

I. Hardware Sets:

OVERTUR 125957 V1 /OPT

HARDWARE GROUP NO. 01
For use on Door #(s):
1A 1B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL-OP-110MD	626	VON
1	EA	SFIC MORTISE CYL.	80-102 X K510-730 XQ11-948 36-083	626	SCH
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
2	EA	SFIC CORE	80-036	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	328AA-S AT JAMB LEGS	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

HARDWARE GROUP NO. 02
For use on Door #(s):
1D
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
2	EA	OH STOP	90S	630	GLY
1	EA	MEETING STILE	44STST	STST	ZER
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 03
For use on Door #(s):
2A 6 7
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	L9070HD 06N	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	GASKETING	328AA-S AT JAMB LEGS	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

HARDWARE GROUP NO. 04
For use on Door #(s):
2B
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
2	EA	SURFACE CLOSER	4040XP H	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	MEETING STILE	44STST	STST	ZER
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 05
For use on Door #(s):
3
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080HD 06N	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	GASKETING	328AA-S AT JAMB LEGS	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	MEETING STILE	44STST	STST	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

CLOSER AT ACTIVE DOOR ONLY

HARDWARE GROUP NO. 06
For use on Door #(s):
4
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK W/ INSIDE INDICATOR	ND50HD RHO IS-LOC	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 07
For use on Door #(s):
5
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-EO	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL-OP-110MD	626	VON
1	EA	SFIC MORTISE CYL.	80-102 X K510-730 36-083	626	SCH
2	EA	SFIC MORTISE CYL.	80-102 X K510-730 XQ11-948 36-083	626	SCH
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
4	EA	SFIC CORE	80-036	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	488FSBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

HARDWARE GROUP NO. 08

For use on Door #(s):

8 16B 20

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 09

For use on Door #(s):

9 11A 11B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	ND78HD RHO IS-CRS	626	SCH
2	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQUIRED	626	IVE
1	EA	GASKETING	488FSBK PSA	BK	ZER

HARDWARE GROUP NO. 10

For use on Door #(s):

12 29

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-EO	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL-OP-110MD	626	VON
1	EA	SFIC MORTISE CYL.	80-102 X K510-730 36-083	626	SCH
2	EA	SFIC MORTISE CYL.	80-102 X K510-730 XQ11-948 36-083	626	SCH
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
4	EA	SFIC CORE	80-036	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

PERIMETER SEAL BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 11

For use on Door #(s):

13 23 24

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQUIRED	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12
For use on Door #(s):
16A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQUIRED	626	IVE
1	EA	GASKETING	488FSBK PSA	BK	ZER

HARDWARE GROUP NO. 13
For use on Door #(s):
17 18
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80HD RHO	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 14
For use on Door #(s):
25A 26A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	L9071HD 06N IS-LOC	626	SCH
2	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	GASKETING	328AA-S AT JAMB LEGS	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

HARDWARE GROUP NO. 15
For use on Door #(s):
25B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY	ND78HD RHO 47342586	626	SCH
2	EA	SFIC CORE	80-036	626	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQUIRED	626	IVE
1	EA	GASKETING	488FSBK PSA	BK	ZER

HARDWARE GROUP NO. 16
For use on Door #(s):
27
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL-OP-110MD	626	VON
1	EA	SFIC MORTISE CYL.	80-102 X K510-730 XQ11-948 36-083	626	SCH
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
2	EA	SFIC CORE	80-036	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	328AA-S AT JAMB LEGS	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	AL	MIS

Maintenance Materials, provide the following:

As-built hardware schedule

Copies of warranty information for each hardware type

Binder of catalog cuts or complete catalog sections of items used, installation and maintenance/adjustment information.

Collection of tools that were included with the hardware: wrenches, drivers, etc.

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. HMD-1 & HMF-1

B. Thermally insulated hollow metal doors with frames.

C. Hollow metal borrowed lites glazing frames.

D. Accessories, including glazing and louvers.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Caulking between frames to concrete and masonry.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

D. Section 09 91 23 - Interior Painting: Field painting.

E. Section 09 96 00 - High-Performance Coatings: 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. SDI: Steel Door Institute.

E. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

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 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.

J. 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.

K. 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.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

M. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

N. NAAMM HMMA 820 TN03 - Guidelines for Glazing of Hollow Metal Transoms, Sidelights and Windows.

O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.

P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.

Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.

R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.

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. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

G. Manufacturer's Qualification Statement.

H. 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 MANUFACTURERS

A. Basis of Design Product: Hollow Metal Doors as manufactured by DCI Hollow Metal, or equal.

B. Hollow Metal Doors and Frames:

1. DCI Hollow Metal: www.dcihollowmetal.com.
2. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
3. Curries, an Assa Abloy Group company: www.assaabloydss.com.
4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
5. Steelcraft, an Allegion brand: www.allegion.com/sle.
6. Technical Glass Products: www.tgpamerica.com/#sle.
7. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed 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 ADA Standards 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: Manufacturer's 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 (galvannealed) 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 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) 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.

2.03 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 galvannealed coating; ASTM A653/A653M.
2. Core Material: Vertical steel stiffeners with fiberglass batts.
    a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
3. Door Thermal Resistance: U-factor of 0.70 maximum.

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.
6. Door Finish: Factory primed and field finished.
    a. Provide compatible primer for Section 09 96 00 - High-Performance Coatings.

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 galvannealed 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.

2.04 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.
1. Provide compatible primer for Section 09 96 00 - High-Performance Coatings.

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: 16 gage, 0.053 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. Frames for 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.

F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 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. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

C. Field Applied Finish Painting: As specified in:
1. Section 09 91 23 - Interior Painting.
2. Exterior Doors (Abuse Resistant): Section 09 96 00 - High-Performance Coatings.

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
1. Style: Sightproof inverted Y blade.
    a. Fixed: Where indicated, provide fixed louvers consisting of inverted blades, formed of not lighter than 18 gage steel, welded or tenoned to 18 gage steel frames. Form louvers of same material specified for stiles and rails.
2. Moldings:
    a. Not lighter than 18 gage galvanized steel moldings, or 18 gage hot or cold rolled steel moldings.
    b. Moldings shall be nonremovable on exterior or corridor side of door.
    c. Form moldings for exterior doors of hot dip galvanized steel.
3. Fasteners: Exposed, tamper proof fasteners.

4. Insect Screens: Provide with 18 by 14 mesh bronze insect screen fabric in a zinc coated steel, rewireable frame finished to match the door.

B. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: 12 inch wide by 12 inch high.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   3. Metal Finish: Dark Bronze polyester powder coating.

C. 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 meeting rooms, offices, staff occupied, and other spaces as indicated.
         2) Size: As indicated on Drawings.

D. 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.

E. Astragals for Double Doors: Specified in Section 08 71 00.

F. 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. Provide one floor anchor and the number of wall anchors listed below welded into each jamb member.
         1) Number of anchors at:
            (a) Steel Stud Partitions: Typically 4, and 5 for doors over 7'-0" high.
      b. Wall anchors shall be of type indicated for the specific wall condition and of same material specified for frames.
      c. Provide head anchors welded into head member as recommended by the frame manufacturer.
      d. Anchors: 16 gage minimum for galvanized frames and 16 gage minimum for cold or hot rolled steel frames.
      e. 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.

G. 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.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

I. 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

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. Coordinate frame anchor placement with wall construction.

C. 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.

D. Comply with glazing installation requirements of Section 08 80 00.

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.

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. Window Installation, General: Place glazing and adjust for proper clearances. Refer to Section 08 80 00 - Glazing for Installation requirements.

I. For waterproofing of hollow metal window frames, follow NAAMM HMMA 820 TN03.

J. 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.

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 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

D. Section 09 91 23 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ASTM E413 - Classification for Rating Sound Insulation.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

E. WI (MCP) - Monitored Compliance Program (MCP).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 12 by 12 inches in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Test Reports: Show compliance with specified requirements for the following:

1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

J. Specimen warranty.

K. Warranty, executed in District's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Company with at least one project within past five years with value of woodwork within at least 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.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Woodwork Quality Assurance Program:

1. Comply with WI (MCP) woodwork association quality assurance service/program in accordance with requirements for work specified in this section; www.woodworkinstitute.com/#sle.

2. Provide labels or certificates indicating that installed work will comply with AWMAC/WI (NAAWS) requirements for grade or grades specified.

3. Provide designated labels on shop drawings as required by quality assurance program.

4. Provide designated labels on installed products as required by quality assurance program.

5. Submit documentation upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

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

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in District's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Haley Brothers: www.haleybros.com/#sle.
2. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com/#sle.
3. Oregon Door: www.oregondoor.com.
4. VT Industries, Inc: www.vtindustries.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Extra Heavy Duty performance, in accordance with AWMAC/WI (NAAWS) or WDMA I.S. 1A.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
2. Sound Retardant Doors: Minimum STC of 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
3. Wood veneer facing with factory transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type staved lumber core (SLC), plies and faces as indicated.

B. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Architect selected, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with slip match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face; unless otherwise indicated.

1. Vertical Edges: Any option allowed by quality standard for grade.
2. "Running Match" each pair of doors and doors in close proximity to each other.
3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type II - water resistant.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:

a. System - 11 Polyurethane Catalyzed.

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: Flat.

B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:

1. Transparent:

a. System - TR-6, Catalyzed Polyurethane.

b. Stain: As selected by Architect.

c. Sheen: Satin.

2. Opaque:

a. Manufacturers standard, in compliance with performance duty level indicated.

b. Color: As selected by Architect.

c. Sheen: Satin.

C. Factory finish doors in accordance with approved sample.

D. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Glazed Openings: Comply with CBC Section 716.2.5 and Chapter 24.
   1. Vision Panel: Factory installed.
      a. Application: Provide at all new classroom, office, corridor and other teacher and staff occupied spaces.
      b. Size (WxH): 6 by 32 inches, unless indicated otherwise on Drawings.
   2. Glazing: Single vision units, 1/4 inch thick glass.
   3. Tint: Clear.
C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
D. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions, rated listing, and specified quality standard.
B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
C. Use machine tools to cut or drill for hardware.
D. Coordinate installation of doors with installation of frames and hardware.
E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.
B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.
B. Adjust closers for full closure.

3.05 SCHEDULE - SEE 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 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. CBC - California Building Code.

B. DSA IR 25-3 - Suspended Gypsum Board Ceiling.

C. ITS (DIR) - Directory of Listed Products.

D. 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.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Installer'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.

C. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

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.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. 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.

B. 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 (FRD). Provide UL label on each fire-rated access door.

2.02 ACCESS DOORS AND PANELS ASSEMBLIES

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.

C. Wall-Mounted Units:

1. Location: As indicated on drawings.
2. Panel Material: Steel.
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.

D. 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.

E. 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.

F. Ceiling-Mounted Units:
1. Location: As indicated on drawings.
2. Panel Material: Steel.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Framed Ceiling Attic Access Panel: 20 by 30 inches. CBC Section 1209.2.
5. Size - Other Ceilings: 12 by 12 inches. Unless otherwise noted on Drawings.
   a. Maximum 325 square inches per DSA IR 25-3 in suspended gypsum board ceilings, for utility access only.
      1) Provide a permanently attached warning label stating:
         (a) "Warning: Do not climb, walk, or crawl on the gypsum board ceiling panels or metal framing. Do not store or stow anything on the gypsum board or metal framing."
6. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   a. Open with allen wrench - no keys.
   b. 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, Inc. - JL Industries: www.activarcpg.com/#sle.
2. ACUDOR Products Inc: www.acudor.com/#sle.
3. Babcock-Davis: www.babcockdavis.com/#sle.
4. Cendrex, Inc: www.cendrex.com/#sle.
5. Karp Associates, Inc: www.karpinc.com/#sle.
6. Larsen's Manufacturing Co.: www.larsensmfg.com.
7. Nystrom, Inc: www.nystrom.com/#sle.
8. 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: Exposed frame with door surface flush with frame surface.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   b. Plaster Mounting Criteria: Use plaster bead type frame.
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. Single Steel Sheet Door Panels: 16-gauge, 0,0625-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.
8. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
    a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
    b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
9. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
10. Door/Panel Size: As indicated on the drawings.
11. 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.

C. 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.

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. AL-1

B. Infill panels of glass.

C. Aluminum doors and frames.

D. Weatherstripping.

1. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Steel attachment members.

B. Section 05 50 00 - Metal Fabrications: Steel attachment devices.

C. Section 07 25 00 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.

D. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

E. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

F. 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. ADA Standards - 2010 ADA Standards for Accessible Design.

C. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

D. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

E. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).

F. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

K. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

L. ASTM D2287 - Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.

M. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

N. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

P. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

Q. CBC - California Building Code.

R. CBC Chapter 11B - California Building Code-Chapter 11B.

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

U. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

V. SSPC-Paint 20 - Zinc-Rich Coating (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, door hardware, and internal drainage details.

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. Include construction details and fabrication methods, profiles and dimensions of individual components, data on hardware, accessories, and finishes.

2. Complete, indicating elevation views of all units, attachments to surrounding construction of Project, type of glazing, and all door hardware and weatherstripping. Manufacturer to prepare all Shop Drawings and 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.

1. 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.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Manufacturer's qualification statement.

J. Installer's qualification statement.

K. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least ten years of documented experience.

1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.

a. Insulating Glass Certification Council (IGCC).

b. Safety Glazing Certification Council (SGCC).

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

a. North American Contractor Certification (NACC) for glazing contractors.

b. Equivalent independent third-party ANSI accredited certification.

C. Single-Source Responsibility: All entrances and storefront framing and doors, including finish, shall be the product of one manufacturer.

1.07 MOCK-UPS

1.08 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.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 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 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.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

E. Provide two year manufacturer warranty against failure of door corner construction for standard duty narrow or medium stile doors.

F. Provide five year manufacturer warranty against failure of door corner construction for heavy duty wide stile doors.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with Code requirements for safety glazing, accessibility and exit devices.

1. Conform to applicable requirements of the ADA Standards regarding accessibility requirements for door and entrance hardware.

2. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.

3. Exit devices shall comply with CBC Section 1010.2.2 and 11B-404.2.7. Lever handle trim to match locksets.

4. Conform to applicable requirements of Title 24, Part 2, CCR, including CBC Chapter 11B-404.2.7, 11B-404.2.9, and 1010.2, regarding exiting and accessibility requirements for door and entrance hardware.

5. Exterior doors to have 5 pounds maximum pressure to open and interior doors to have 5 pounds maximum pressure to open. CBC Chapter 11B-404.2.9.

2.02 MANUFACTURERS

A. Aluminum-Framed Storefronts:

1. Basis of Design: Arcadia, Inc: www.arcadiainc.com/#sle.
2. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/#sle.
3. Kawneer North America: www.kawneer.com/#sle.
4. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
5. 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. 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.
    c. 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.

2.03 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken:

1. Basis of Design: Arcadia, Inc.; Offset Glazed System TC470 Series - Thermal - Shear Block Inside Set: www.arcadiainc.com.

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

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.04 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

A. Center-Set Style:

1. Basis of Design: Arcadia, Inc.; Center Glazed System A400 Series - Non-Them - Shear Block Inside Set: www.arcadiainc.com.

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

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.05 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:

1. Basis of Design: Arcadia, Inc.; WS512HD Series Heavy Duty Wide Stile: www.arcadiainc.com.
2. Thickness: 1-3/4 inches.

2.06 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 inch insulating glazing.
2. Finish: Class I natural 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. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.

B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
    a. Design Wind Loads: Comply with requirements of ASCE 7.

b. Member Deflection: Limit member deflection to flexure limit of glass or 1/175 of span, maximum 3/4 inch (over 11'-0" span), in any direction, with full recovery of glazing materials.

2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.

3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

4. Energy Performance:

a. NFRC Values:

U-Value, NFRC 100	0.41
Solar Heat Gain Coefficient, NFRC 300	0.34
Visible Transmittance, NFRC 200	0.61

b. The District has used NFRC certified values for the analysis of this building. It does not allow for the use of CCR Title 24 default values.

c. Provide products that meet or exceed the U-factor and S.H.G.C. values listed on the ENV-1 form, filed in the contract documents elsewhere.

d. AAMA ratings are not allowed under CCR Title 24 and will not be acceptable.

5. Resistance to Forcible Entry: Jambs adjacent to door locks shall resist a force of 1600 lbs

2.07 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. Cross-Section: As indicated on drawings.

B. Glazing: See Section 08 80 00.

C. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.

2. Top Rail: 6 inches wide, nominal.

3. Vertical Stiles: 5 inches wide, nominal. Coordinate with hardware for a complete installation.

4. Bottom Rail: 10 inches wide.

5. Glazing Stops: Square.

6. Finish: Same as storefront.

2.08 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/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. Perimeter Sealant: As specified in Section 07 92 00 - Joint Sealants.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

H. Sealant for Setting Thresholds: Non-curing butyl type.

I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

J. Glazing Accessories: See Section 08 80 00.

K. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

L. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.09 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.10 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 08 71 00.

C. Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D2000 or molded PVC complying with ASTM D2287 pile, continuous and replaceable; provide on all exterior doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier 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. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

1. Comply with requirements specified in Section 07 62 00 - Sheet Metal Flashing and Trim. Set sill flashing in bedding sealant as specified in Section 07 92 00 - Joint Sealants.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Install perimeter sealant in accordance with Section 07 92 00-Joint Sealants.

J. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

K. Door Installation: Assemble doors in shop with glazing installed.

1. Door Joints: Make joints rigid and suitable for heavy use.

L. Set thresholds in bed of sealant and secure.

M. 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. See Section 01 40 00 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Water-Spray Test by Contractor: Provide water spray quality test of installed storefront components in accordance with 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: Installer to water test all storefront and glazing in the presence of the Architect, Project Inspector (IOR), and Owner Representative by spraying with hose heavily for 5 minutes. Repair all leaks discovered by testing procedures and repeat test until leak-free performance is achieved.

C. District to Provide field testing of installed storefront system by AAMA accredited independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.

1. Perform a minimum of two tests in each designated area as indicated on drawings.
2. Conduct tests in each area prior to 35 percent and 70 percent completion of this work.
3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
    a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

D. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 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.

3.07 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. Lock cylinders for doors that hardware is specified in other sections.

C. Thresholds.

D. Weatherstripping and gasketing.

E. Replacement hardware for existing doors.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.

C. Section 10 14 23 - Panel Signage: Additional signage requirements.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. BHMA (CPD) - Certified Products Directory.

C. BHMA A156.1 - Standard for Butts and Hinges.

D. BHMA A156.3 - Exit Devices.

E. BHMA A156.4 - Door Closers and Pivots.

F. BHMA A156.5 - Cylinders and Input Devices for Locks.

G. BHMA A156.6 - Standard for Architectural Door Trim.

H. BHMA A156.7 - Template Hinge Dimensions.

I. BHMA A156.13 - Mortise Locks & Latches Series 1000.

J. BHMA A156.16 - Standard for Auxiliary Hardware.

K. BHMA A156.17 - Self Closing Hinges & Pivots.

L. BHMA A156.20 - Standard for Strap and Tee Hinges, and Hasps.

M. BHMA A156.21 - Thresholds.

N. BHMA A156.22 - Standard for Gasketing.

O. BHMA A156.26 - Standard for Continuous Hinges.

P. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems.

Q. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

R. CBC - California Building Code.

S. CBC Ch. 11B - California Building Code-Chapter 11B.

T. DHI (H&S) - Sequence and Format for the Hardware Schedule.

U. DHI (KSN) - Keying Systems and Nomenclature.

V. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

W. DSA BU 11-05 - Impact of AB 211 - Concerning Door Hardware.

X. DSA BU 19-05 - AB 3205 Door Hardware Requirements.

Y. UL (DIR) - Online Certifications Directory.

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.
    f. Owner's Security Consultant.
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. Contractor to provide a blank key schedule in excel format for District review and approval prior to formal submittal.

5. 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.
6. 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.
7. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work

C. 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.

D. 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.

E. 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; see Section 08 0671.
    3. List groups and suffixes in proper sequence.
    4. Provide complete description for each door listed.
    5. Provide manufacturer name, 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.

F. 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.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

H. 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.

I. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

J. Manufacturer's qualification statement.

K. Installer's qualification statement.

L. Supplier's qualification statement.

M. 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.

N. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
1. Include keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report

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. 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 for commercial door hardware with at least three years of documented experience.

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 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. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
    e. 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.

1.09 WARRANTY

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

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in District's name and register with manufacturer.

1. Mechanical Closers: Thirty years, minimum.
2. Mechanical Exit Devices: Three years, minimum.
3. Mechanical Locksets and Cylinders: Three years, minimum.
4. Continuous and Butt Hinges: Life of the building.

5. Key Blanks: Lifetime
6. Other Hardware: Two years, minimum.

C. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

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. Regulatory Requirements:

1. Comply with State Fire Marshal Standards.
    a. Lever of lever actuated latches or locks shall be curved with a return to within 1/2 inch of the door to prevent catching on the clothing of persons during egress. SFM 12-10-2 Latching/Locking, Section 12-10-202(f).
    b. The cross-bar shall extend across not less than one-half the width of the door/gate. 12-10-3 Exits, Section 12-10-302(a).
    c. The ends of the cross-bar shall be curved, guarded or otherwise designed to prevent catching on the clothing of persons during egress. SFM 12-10-3 Exits, Section 12-10-302(d).
2. Conform to applicable requirements of the CBC Chapter 11B and ADA Standards regarding accessibility requirements for door and entrance hardware including gates.
    a. Doors/doorways as part of an accessible route shall comply with CBC Sections 11B-404.
    b. Doors shall meet California Building Code Sections 11B-206.5, 11b-404.1 and 1010.1.
    c. The clear opening width for a door shall be 32 inches minimum. CBC Section 11B-404.2.3
        1) For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees.
        2) 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.
        3) Door closers and stops shall be permitted to be 78 inches minimum above the finish floor or ground.
        4) 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.
    d. 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.

1) Operable parts of such hardware shall be 34 inches minimum and 44 inches maximum above finish floor or ground.

2) 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

e. The force for pushing or pulling open a door shall be as follows : CBC Section 11B-404.2.9.

1) Interior Hinged Doors, sliding or folding doors, and exterior hinged doors: 5 lbs maximum.

2) 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.

3) 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.

f. Door closing speed shall be as follows: CBC Section 11B-404.2.8

1) 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.

2) 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.

g. Thresholds shall comply with CBC Section 11B-404.2.5.

h. Floor stops shall not be located in the path of travel and 4 inches maximum from walls.

i. Hardware (including exit devices) shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met.

1) Such hardware has a 'dogging' feature.

2) It is dogged during the time the facility is open.

3) Such 'dogging' operation is performed only by employees as their job function (non-public use).

j. 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

3. 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.

4. Education Code (EDC) Section 17583 (SB/AB 211 & AB 3205) - DSA Bulletins, DSA BU 11-05 and DSA BU 19-05.

a. Provide all latching devices that are lockable (including but not limited to door locks and panic/exit devices) that comply with CBC 1010.2.8.2:

1) All new construction projects to include locks that allow the doors to be locked from the inside.

2) 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.

D. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Comply with DSA BU 11-05 and DSA BU 19-05; CBC section 1010.2.8..2
   3. Accessibility: ADA Standards, CBC Chapter 11B.
   4. Listed and certified compliant with specified standards by BHMA (CPD).
   5. Auxiliary Hardware: BHMA A156.16.
   6. Straps and Tee Hinges: BHMA A156.20.
   7. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.
   1. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.

F. 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. 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. 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.

a. Geared-type aluminum.

1) Use wide-throw units where needed for maximum degree of swing, advise Architect if commonly available hinges are insufficient.

2) If units are used at storefront openings, color-coordinate hinge finish with storefront color.

(a) Custom anodizing and custom powdercoat finishes subject to Architect approval.

4. Provide hinges on every swinging door.

5. Provide five-knuckle full mortise butt hinges unless otherwise indicated.

6. Provide ball-bearing hinges at each door with closer.

7. 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.

8. 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. 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 Bulletins DSA BU 11-05 and DSA BU 19-05); CBC Section 1010.2.8.2 and 1010.2.9.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.

1. Lever design to match lockset trim.
    a. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
        1) Lever Style: Match lever style of locksets.
        2) Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.
2. Provide cylinder with cylinder dogging or locking trim on fire non-rated doors.
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 CBC Ch. 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 1010.2.9 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 weather-resistant devices when installed on exterior gates.
10. Independent lab-tested 1,000,000 cycles.
11. 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. 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 Bulletins DSA BU 11-05 and DSA BU 19-05; CBC section 1010.2.8.2.

B. 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. Rabbet Front and Strike: Provide on locksets for use with rabbeted meeting rails.
    c. Finish: To match lock or latch.
5. Lever Trim**:** through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
    a. Spindles**:** security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
    b. Inside lever applied by screwless shank mounting – no exposed trim mount screws.
    c. Levers rotate up or down for ease of use.
    d. Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

C. Door shall be openable from inside with a single motion w/o the use of any tools, effort , or special knowledge.

2.07 DOOR PULLS AND PUSH PLATES

A. 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: Stainless steel, 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.

2.08 CLOSERS

A. Closers: Comply with BHMA A156.4, Grade 1.

1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Operating Force: Adjustable to maximum 5 lbs operating force. Comply with ADA Standards and CBC Ch. 11B.
4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
5. At outswinging exterior doors, mount closer on interior side of door.

2.09 PROTECTION PLATES

A. Protection Plates: Comply with BHMA A156.6.

B. Metal Properties: Stainless steel.

1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.

C. Edges: Beveled, on four sides unless otherwise indicated.

D. Fasteners: Countersunk screw fasteners.

E. Drip Guard: Provide at head of exterior doors unless covered by roof or canopy.

2.10 KICK PLATES

A. 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: 10 inch high by 2 inch less door width (LDW) on push side of door.

2.11 FLOOR STOPS

A. Manufacturers:

1. Substitutions: Not permitted.

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: Closer hold open, with dome floor stop.
3. Material: Bronze housing with rubber insert.
4. Type: Closer hold open, with stem floor stop.

2.12 THRESHOLDS

A. 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. Provide threshold with Sound Transmission Class (STC) of 25-30 at locations indicated.
4. Type: Flat surface.
5. Material: Aluminum.
6. Threshold Surface: Fluted horizontal grooves across full width.
7. Field cut threshold to profile of frame and width of door sill for tight fit.
8. Provide non-corroding fasteners at exterior locations.

2.13 WEATHERSTRIPPING AND GASKETING

A. Rigid Seals:
   1. Weatherstripping and Gasketing: Comply with BHMA A156.22.
      a. Head and Jamb Type: Self-adhesive.
      b. Door Sweep Type: Door shoe.
      c. Material: Aluminum, with brush weatherstripping.
      d. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
      e. Provide door bottom sweep on each exterior door, unless otherwise indicated.
      f. Provide sound-rated gasketing and automatic door bottom on doors indicated as "Sound-Rated", "Acoustical", or with "Sound Transmission Class (STC) rating"; fabricate as continuous gasketing, do not cut or notch gasketing material.

B. Adhesive Seals and Bottoms:
   1. Weatherstripping and Gasketing: Comply with BHMA A156.22.
      a. Head and Jamb Type: Self-adhesive.
      b. Material: Aluminum, with brush weatherstripping.
      c. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
      d. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.14 SIGNAGE

A. See Section 10 14 23 - Panel Signage for additional signage requirements.

2.15 SILENCERS

A. 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.

2.16 KEY CONTROL SYSTEMS

A. 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. 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."

2.17 KEY CABINET

A. Manufacturers:
   1. Lund Equipment: www.lundkeycab.net.
   2. Telkee: www.telkee.com.
   3. Substitutions: Not permitted.

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. Horizontal metal hook strips with replaceable labels covered with clear plastic.
   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.

2.18 FIRE DEPARTMENT LOCK BOX

A. Manufacturers:
   1. Knox Company; Knox-Box Rapid Entry System: 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).

2.19 FINISHES

A. Finishes: Identified in Section 08 0671 - 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. Field-verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware.

C. 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. 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.

C. Use templates provided by hardware item manufacturer.

D. Do not install surface mounted items until application of finishes to substrate are fully completed.

E. 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 1010.2.3, 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. 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.

F. 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. See Section 07 92 00 for additional requirements.

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 door closers per "Commissioning" article below.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

D. 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. 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. Insulating glass units. G-1 & G-2.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 27 00 - Air Barriers.

C. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

D. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

E. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

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 C1172 - Standard Specification for Laminated Architectural Flat Glass.

I. ASTM C1193 - Standard Guide for Use of Joint Sealants.

J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

M. BS EN 14179-1 - Glass in Building - Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass - Part 1: Definition and Description.

N. CBC - California Building Code.

O. GANA (GM) - GANA Glazing Manual.

P. GANA (SM) - GANA Sealant Manual.

Q. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

R. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

U. 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 12 by 12 inch in size of glass and plastic units.

E. Sustainable Design Submittal: Environmental Product Declaration (EPD) Type III, ISO 14025.

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) 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.

1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.

a. Insulating Glass Certification Council (IGCC).

b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 MOCK-UPS

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

B. Provide mock-up of each type of glazing system including glass and air barrier and vapor retarder seal.

C. Provide on-site glazing mock-up with the specified glazing components.

D. Locate where directed.

E. Mock-ups may remain as part of the Work.

1.08 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.

1.09 WARRANTY

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

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.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

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 class A and CPSC 16 CFR 1201 and are so identified in accordance with CBC Section 2406.2 and 2406.3.

C. Glass Identification: Per CBC Section 2403.1, each light shall bear the manufacturer's label designating the type and thickness of glass.

1. 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.
2. 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.
3. The label shall be legible and visible from the inside of the building after installation and shall specify that label shall not be removed.
4. Tempered glass shall have an etched manufacturer's label.

2.02 MANUFACTURERS

A. Glass Fabricators:

1. Glass Fab; www.glassfabusa.com.
2. Glasswerks Inc.: www.glasswerks.com.
3. GlasPro, Inc.: www.glas-pro.com
4. Viracon, Inc: www.viracon.com/#sle.
5. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Float Glass Manufacturers:

1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. GlasPro, Inc.: www.glas-pro.com
3. Guardian Glass, LLC: www.guardianglass.com/#sle.
4. Saint Gobain North America: www.saint-gobain.com/#sle.
5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
6. Or Equal 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. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
a. Water-Resistive Barriers: See Section 07 25 00.
b. Air Barriers: See Section 07 27 00.
2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
3. To maintain a continuous vapor retarder and/or air barrier throughout 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 7 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 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. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with BS EN 14179-1.
6. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria. CBC 2406.2.

7. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
8. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category I impact test requirements.
2. Ionoplast Interlayer: 0.035 inch thick, minimum.
a. Basis of Design Product: SentryGlas®Plus (SGB) Interlayer as manufactured by Kuraray America Inc., www.kuraray.us.com, or approved equal.

2.05 INSULATING GLASS UNITS

A. Manufacturers:
1. Glass: Any of the manufacturers specified for float glass.
2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
3. Glasswerks: glasswerks.com.
4. Pilkington North America Inc: www.pilkington.com/na/#sle.
5. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
6. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
7. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
a. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.
7. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

b. Inert gas may be installed in the field into air space in accordance with insulating glass fabricator's and installer's requirements.

D. Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Metal edge spacer.
   5. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   6. Total Thickness: 1 inch.
   7. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
   8. Visible Light Transmittance (VLT): 51 percent, nominal.
   9. Solar Heat Gain Coefficient (SHGC): 0.23, nominal.
   10. Visible Light Reflectance, Outside: 12 percent, nominal.
   11. Glazing Method: Dry glazing method, gasket glazing.

E. Insulating Glass Units: Safety glazing.
   1. Applications:
      a. Glazed lites in exterior doors.
      b. Glazed sidelights and panels next to doors.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Space between lites filled with air.
   3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
   4. Tint: Clear.
   5. Total Thickness: 1 inch.
   6. Metal edge spacer.
   7. Glazing Method: Dry glazing method, gasket glazing.

2.06 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Total Thickness: 1 inch.

4. Durability: Certified by an independent testing agency to comply with ASTM E2190.
5. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
6. Metal Edge Spacers: Aluminum, bent and soldered corners.
7. Spacer Color: Black.
8. Edge Seal:
    a. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
    b. Color: Black.
9. Purge interpane space with dry air, hermetically sealed.
10. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

B. G-1 & G-2 Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
1. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
    a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
    b. Glass: Clear.
2. G-1 Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
3. G-2 Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
    a. Coating: Ceramic frit on #3 face. Pattern as selected by Architect.
    b. Glass: Clear.
    c. Coating: No coating on inboard lite.
    d. Glass: Clear.

C. Substitution Procedures: See Section 01 60 00 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.07 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.

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. Other locations required by applicable federal, state, and local codes and regulations.
    d. 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.

2.08 GLAZING COMPOUNDS

A. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, nonsagging 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; nonbleeding, nonstaining; 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.

2.09 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.

2.10 SOURCE QUALITY CONTROL

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

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, and paint.

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 nonpermanent 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.

B. Removal of existing floor coverings.

C. Preparation of 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.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens).

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete.

C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

G. 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. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Visual Observation Report: For existing floor coverings to be removed.

C. 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.

D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1. Manufacturer's qualification statement.
2. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
3. Manufacturer's installation instructions.
4. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

E. 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. Submit report directly to District.
7. Submit report not more than two business days after conclusion of testing.

F. Adhesive Bond and Compatibility Test Report.

G. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.

H. Copy of RFCI (RWP).

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by District.

B. Contractor may perform additional 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 District 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; ARDEX Feather Finish: www.ardexamericas.com/#sle.
    b. Floor Seal Technology, Inc; Color Match Patch: www.floorseal.com/#sle.
    c. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
    d. Mapei International; Mapei Ultraplan 1 Plus: www.mapei.com.
    e. Sika Corporation; Sika Level-315: www.sikafloorusa.com.
    f. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
    g. 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 VB 100: 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: 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 VAPOR BAN E: www.laticrete.com/#sle.

f. Maxxon Corporation; Aquafin SG4: www.maxxon.com/#sle.

g. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer: www.sikafloorusa.com/#sle.

h. USG Corporation; Durock CoverPrep: www.usg.com/#sle.

i. 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.
   c. Remove existing coatings and curing agents from surface according to recommendations of remedial coating manufacturer.
   d. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
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 (RWP), 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 APPLICATION OF REMEDIAL FLOOR TREATMENT

A. Comply with requirements and recommendations of treatment manufacturer.

3.11 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. Cementitious backing board.

B. Gypsum wallboard.

C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

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

B. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

C. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

E. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

I. GA-216 - Application and Finishing of Gypsum Panel Products.

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

K. United States Gypsum Co. (USG) Specification and Technical Bulletins No. SA 923, No. SA 924, and No. SA 925, as applicable for materials location, installation and condition of construction.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

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.

C. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

D. Sequencing: Install service utilities 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 data on gypsum board, accessories, and joint finishing system.

a. Joint Treatment Materials: Submit manufacturer's product data, indicating VOC content.

C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

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. Evaluation Service Reports: Show compliance of grid suspension systems with specified requirements.

F. Installer's Qualification Statement.

1. Including contractor’s recognition in the SFIA “Contractor Certification Program”, or equal.

G. Provide letter from manufacturer that upper and lower track system to be utilized will maintain sound and fire rating of specified assembly.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented 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. Documents at Project Site: Maintain at the project site a copy of manufacturer's instructions, erection drawings, and shop drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

C. Store metal products to prevent corrosion.

1.08 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.

2.02 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. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
4. USG Corporation: www.usg.com/#sle.
5. 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.
3. Thickness:
    a. Vertical Surfaces: 5/8 inch.
    b. Ceilings: 5/8 inch.

c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

4. Mold-Resistant, Paper-Faced Products:

a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.

b. Georgia-Pacific Gypsum; ToughRock Mold-Guard: www.gpgypsum.com/#sle.

c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.

d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.

e. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.

f. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

g. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

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

D. 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 (Restrooms and kitchens).

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: Regular and Type X, in locations indicated.

5. Type X Thickness: 5/8 inch.

6. Regular Board Thickness: 1/2 inch.

7. Edges: Tapered.

8. 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. Georgia-Pacific Gypsum; DensArmor Plus: www.gpgypsum.com/#sle.

d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.

e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.

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

2.03 GYPSUM BOARD ACCESSORIES

A. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.

1. Corner Beads: Low profile, for 90 degree outside corners.

a. Products:

1) Cornerbead: USG Sheetrock B1 XW EL, or equal.

2) L Trim: USG Paper-faced "L" trim, B4 or equal.

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

2. Expansion Joints:

a. Fire-Resistance Rated: 1 hour when joint system tested in accordance with UL 2079.

b. Products:

1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.

2) Trim-Tex, Inc; Fire Rated 093V Expansion Bead: www.trim-tex.com/#sle.

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

B. 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: Setting type, field-mixed.

C. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

1. Products:

a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfacer with M2Tech: www.certainteed.com/#sle.

b. USG Corporation; USG Sheetrock Brand Tuff-Hide Primer-Surfacer: www.usg.com/#sle.

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

D. Nails for Attachment to Wood Members: ASTM C514.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Beginning of installation means acceptance of substrate.

C. Maintain a minimum temperature of 50 degrees F for a period extending from 48 hours before installation until the joint compounds have completely dried.

D. 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.

E. Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board.

F. Examine substrates which gypsum board wall construction attaches to or abuts, including the following.

1. Piping.
2. Conduit.

G. 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.

H. Fire Protection: Where required, the Work shall comply with the requirements for the protection rating indicated in the governing building code.

3.02 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.

D. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:

1. Single-Layer Applications: Adhesive application.

3.03 INSTALLATION OF TRIM AND ACCESSORIES

A. 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.
2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.04 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
    a. Tape, fill, and sand all exposed joints, edges, and corners with joint and topping compounds using 3-coat method, to produce smooth surfaces ready to receive finishes.
        1) Fill and sand depressions similar to joints except omit tape.
        2) Finish internal corners similar to joints, using folded tape reinforcement.
        3) Complete system with thin skim coat of joint compound over entire gypsum board surface.
        4) Lightly sand to provide a smooth, even surface.
    b. Skim coat required for Level 5. A thin skim coat of joint compound shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
    c. After the skim coat has dried, provide one uniform coat of drywall primer over the entire surface.
2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
    a. At joints and angles, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and flanges of trim accessories.
        1) Panel surfaces and joint compound must be smooth and free of tool marks and ridges.
    b. Provide one uniform coat of drywall primer over the entire surface.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
    a. At joints and angles, embed tape in joint compound and apply one separate coat of joint compound over tape, fastener heads, and flanges of trim accessories.
        1) Joint compound applied on the face of the tape when the tape is embedded is considered a separate coat.
        2) Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable.
4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
    a. Including locations specifically noted for fire taping:
        1) Tape and fill all exposed joints, edges and corners with joint compound using two coat method, to produce level and neat finish.
        2) Sanding is not required, except where not sufficiently level for applied construction.
        3) Add coat of joint compound at sanded joints.
        4) Feather coats onto adjoining surfaces so that camber is maximum 1/16-inch.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.
2. Set tape set over joint and seated into joint compound, leaving sufficient adhesive under tape to provide proper bond.
3. Reinforce internal angles, both horizontal and vertical, and with tape folded to form straight and true angle.
4. Cement metal external corners in place.
5. Allow joints 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.

D. 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.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.05 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.06 REPAIR

A. Repair damage to galvanized coatings in conformance with ASTM A780/A780M.

B. 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.

3.07 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean upon completion of the work, remove from adjacent surfaces, overspray, splatter and daubs of taping and finish compound and textured finishes..

C. Remove tools, equipment, unused material and cuttings and leave the work in a clean orderly manner.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications. CT-1 & CT-2

B. Tile for wall applications. CT-1 & CT-2

C. Cementitious backer board as tile substrate.

D. Ceramic trim.

E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).

C. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.

D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

E. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.

F. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation.

G. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.

H. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

I. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

J. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

K. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar.

L. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

M. ANSI/NFSI B101.3 - Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials.

N. 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.

O. ASTM C847 - Standard Specification for Metal Lath.

P. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products.

Q. SCAQMD 1168 - Adhesive and Sealant Applications.

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

S. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs 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. Discussion topics: dry times, cure times, protection of all steps of tile installation system (membranes, adhesive, grout).

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:

1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

2. Submit documentation of completion of apprenticeship and certification programs.

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. See Section 01 60 00 - Product Requirements, for additional provisions.
2. 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, TCNA (HB), and TCNA (HB-GP) 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.
2. Installer Certification:
   a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
   b. Apprenticeship Program: Installer has achieved Journeyworker status through an apprenticeship from the International Union of Bricklayers and Allied Craftworkers (IUBAC) or a U.S. Department of Labor (DOL)-recognized program.
   c. Advanced Certifications for Tile Installers (ACT): Certification in the installation of membranes, large format tile, gauged porcelain tile/panels/slabs, and grouts.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for general requirements for mock-up.

B. 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 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. Do not install solvent-based products in an unventilated environment.

B. 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. Crossville, Inc. : www.crossvilleinc.com.
3. Dal-Tile Corporation: www.daltile.com/#sle.
4. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. CT-1 & CT-2 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: Interlocking shape.
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, 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. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Products:
      a. SV-1 Basis of Design: Schluter-Systems; As indicated on Drawings: www.schluter.com/#sle.
      b. Blanke Corporation; Blanke - Trims and Profiles: www.blankecorp.com/#sle.
         1) Local Representative: Rick Coury, Tile Industry Sales, Inc. coury@earthlink.net; 714.915.1995.
      c. Genesis APS International: www.genesis-aps.com/#sle.
      d. LATICRETE International, Inc: www.laticrete.com/#sle.
      e. Schluter-Systems: www.schluter.com/#sle.
      f. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

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. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Custom Building Products: www.custombuildingproducts.com/#sle.
   3. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
   4. LATICRETE International, Inc: www.laticrete.com/#sle.
   5. Mapei Corporation: www.mapei.com/#sle.
   6. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
      a. Local Representative: Rick Coury, Tile Industry Sales, Inc. coury@earthlink.net; 714.915.1995.
   7. Sika Corp: www.sika.com/#sle.
   8. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.

1. Applications: Use this type of bond coat where Large and Heavy Tile (LHT) mortar is indicated.
2. Products:
    a. ARDEX Engineered Cements; S 28: www.ardexamericas.com/#sle.
    b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
    c. LATICRETE International, Inc; MULTIMAX LITE: www.laticrete.com/#sle.
    d. Mapei Corporation; Ultraflex LFT: www.mapei.com/#sle.
    e. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
    f. Sika Corp; SikaTile 450 LHT Secure Set: www.sika.com/#sle.
    g. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.05 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. 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: www.laticrete.com/#sle.
5. Mapei Corporation: www.mapei.com/#sle.
6. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Color Grout: www.merkrete.com/#sle.
7. Sika Corp; SikaTile 800 Sanded/UnSanded Grout: www.sika.com/#sle.
8. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

C. 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. ARDEX Engineered Cements; ARDEX FL: www.ardexamericas.com/#sle.
    c. Custom Building Products; Prism Color Consistent Grout: www.custombuildingproducts.com/#sle.
    d. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.

e. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.

f. Merkrete, by Parex USA, Inc; Merkrete Pro Grout Plus: www.merkrete.com/#sle.

g. Sika Corp; SikaTile Secure Grout: www.sika.com/#sle.

h. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. Standard Grout: ANSI A118.6 standard cement grout.

1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.

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 indicated on drawings.

4. Products:

a. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com/#sle.

b. Mapei, Inc.; Keracolor U Wall Grout unsanded: www.mapei.com

c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. 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. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com/#sle.

b. Basis of Design: Custom Building Products; CEG-Lite 100% Solids Commercial Epoxy Grout: www.custombuildingproducts.com/#sle.

c. H.B. Fuller Construction Products, Inc; TEC AccuColor EFX Epoxy Special Effects Grout: www.tecspecialty.com/#sle.

d. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.

e. MAPEI Corporation; Kerapoxy Epoxy Grout: www.mapei.com.

f. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.

g. Sika Corp; SikaTile 825 Epoxy: www.sika.com/#sle.

h. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

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. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.

b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.

c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.

d. Mapei Corporation; Mapesil T Plus: www.mapei.com/#sle.

e. Merkrete, by Parex USA, Inc; Merkrete MK-100SC 100% Silicone Caulk: www.merkrete.com/#sle.

f. Sika Corp; Sikasil N Plus: www.sika.com/#sle.

g. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

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. MAPEI Corporation; UltraCare Grout Sealer: www.mapei.com.

c. Merkrete, by Parex USA, Inc; Merkrete Revive: www.merkrete.com/#sle.

d. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

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. MAPEI Corporation; UltraCare Enhancing Plus Stone Sealer: www.mapei.com.

c. Rust-Oleum Corporation; Miracle Sealants 511 Impregnator Natural Looking Penetrating Sealer: www.rustoleum.com/#sle.

d. STONETECH, a Division of LATICRETE International, Inc; STONETECH BulletProof Stone Sealer: www.laticrete.com/#sle.

e. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

D. Grout Release: Temporary, water-soluble pre-grout coating.

1. Products:

a. Custom Building Products; Aqua Mix Grout Release: www.custombuildingproducts.com/#sle.

b. MAPEI Corporation; UltraCare Grout Release: www.mapei.com.

c. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.07 ACCESSORY MATERIALS

A. 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) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
        2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
        3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
        4) Mapei Corporation; Mapelastic AquaDefense: www.mapei.com/#sle.
        5) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard SP-1: www.merkrete.com/#sle.
        6) Protecto Wrap; Protecto LM: www.protectowrap.com/#sle.
        7) Sika Corp; SikaTile 100 Moisture Guard: www.sika.com/#sle.
        8) USG Corporation; Durock Brand Waterproofing Membrane: www.usg.com/#sle.
        9) Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Membrane at Walls: Placed behind the backer board.
    1. Material: No. 15 asphalt saturated felt.

C. Metal Lath: ASTM C847 Flat diamond mesh, of weight to suit application, galvanized finish.

D. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 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.
        b. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

E. 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. 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.

C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align wall joints.

E. 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.

F. Form internal angles square and external angles bullnosed.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. 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 - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

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. Mounted Tile: As determined by factory-produced spacing.
3. Trim and Accessories: Match adjoining tile units.

B. Wall Tile Grouting: TCNA/ANSI A108.10, latex-portland cement.

C. Do not begin grouting tiles until they are firmly set and a minimum of 48 hours of curing has occurred.

D. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.

E. When using proprietary grout, comply with manufacturer's instructions and recommendations unless otherwise more stringent requirements are specified.

F. Force maximum amount of approved grout into joints in accordance with pertinent recommendations contained in TCNA/ANSI A108.10.

G. Fill joints of cushion-edge tile to depth of cushion; fill joints of square-edge tile flush with tile surface.

H. Fill all gaps and skips.

I. Do not permit mortar or mounting mesh to show through grouted joints.

J. Provide hard finished grout which is uniform in color, smooth, and without voids, pin holes, or low spots.

K. 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. Repair or remove and reinstall as required.

C. 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. ACP-1

B. Acoustical units.

1.02 RELATED REQUIREMENTS

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

B. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC) - Air Outlets and Inlets: Air diffusion devices in ceiling.

C. Division 26 - Electrical - Interior Lighting: Light fixtures in ceiling system.

D. 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 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. DSA IR 16-9 - Pendant Luminaires.

J. DSA IR 25-1 - Maximum Allowable Load for Ceiling Wires.

K. DSA IR 25-2 - Suspended Lay-In Panel Ceiling.

L. DSA IR A-5 - Acceptance of Products, Materials, and Evaluation Reports.

M. 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.

3. Extra Acoustical Units: Quantity equal to 5 percent of total 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.

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. Rockfon, LLC: www.rockfon.com/#sle.
3. 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 1617A.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) DSA IR A-5: Acceptance of Products, Materials, and Evaluation Reports.
        2) DSA IR 16-9: Pendant Luminaires.
        3) DSA IR 25-1: Maximum Allowable Load for Ceiling Wires.
        4) DSA IR 25-2: Suspended Lay-In Panel Ceiling; Revised 11/3/23.

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. Total System Weight: Less than 4 PSF.

C. Acoustical Panels, Type for spaces with higher sound mitigation: Glass fiber with membrane-faced overlay, with the following characteristics:

1. Application(s): ACP-1.
2. Classification: ASTM E1264 Type XII.
    a. Form: 2, cloth.
    b. Pattern: "E" - lightly textured.

3. Size: 24 by 48 inch.
4. Size: 24 by 24 inches.
5. Thickness: 1 inch.
6. Light Reflectance: Nominal 85 percent, determined in accordance with ASTM E1264.
7. NRC Range: >0.85, determined in accordance with ASTM E1264.
8. Articulation Class (AC): Nominal 190, determined in accordance with ASTM E1264.
9. Panel Edge: Square.
10. Tile Edge: Square.
11. Color: White.
12. Suspension System Type TBAR-1: Exposed.
13. Basis of Design Product: Optima 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. (9/16 inch may be acceptable in selected locations)
      a. Main Runners:
         1) Armstrong: Heavy Duty Prelude XL 7301, exposed T.
      b. Cross Tees - "Stake-on end", Stepped End:
         1) Armstrong: XL7328 (24 inch grid), XL7341 (48 inch grid).
      c. Edge Trim:
         1) Armstrong Angle Molding: 7800, 7/8", Prelude 7871 Shadow molding with
   4. Finish: Baked enamel.
   5. Color: White, unless noted otherwise.
      a. Certain ceilings do have specific color requirements.
   6. TBAR-1 Basis of Design Product: Prelude 7301 main runners and XL7320 cross runners - ICC ESR 1308 as manufactured by Armstrong World Industries, or equal.
   7. Products:
      a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
      b. CertainTeed Corporation: www.certainteed.com.

c. Rockfon: www.rockfon.com.

d. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.

1) ICC ESR-1222 and LARR 25764.

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

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, 0.105 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. Acoustical Insulation: ASTM C665 friction fit type, unfaced batts.

1. Thickness: 2 inch.

2. Size: To fit acoustical suspension system.

G. 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 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 assitance 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 54 23
LINEAR METAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal support system and perimeter trim. LBA-1 & LBA-2.

B. Supplementary insulation above ceiling.

1.02 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 C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

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. DSA IR 16-9 - Pendant Luminaires.

H. DSA IR 25-1 - Maximum Allowable Load for Ceiling Wires.

I. DSA IR 25-2 - Suspended Lay-In Panel Ceiling.

J. DSA IR A-5 - Acceptance of Products, Materials, and Evaluation Reports.

1.03 DESIGN REQUIREMENTS

A. Design components to ensure light fixtures will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

B. Performance Characteristics: Provide manufacturers standard system which, when installed, provides the following minimum requirements for structural performance.

1. Wind Load Resistance: for exterior installations, provide components that are capable of with standing general wind loads of up to 40 psf without damage.

2. Specific wind loads at given areas, see specific product requirements listed in Part 2.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

C. Sequencing: Supply hanger clips during steel deck erection. Supply additional hangers and inserts as required.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Furnish for component profiles.

1. Submit manufacturer's product specifications and installation instructions for each metal ceiling material, and for suspension system, including certified laboratory test reports and other data required to show compliance with these specifications.

C. Shop Drawings: Indicate ;

1. Reflected ceiling plans; location of metal ceilings and suspension systems; location of light fixtures, diffusers, speakers, sprinkler heads, and other exposed to view items; list of materials; dimensions, jointing, method of hanger attachment, fastenings and other pertinent information. Include calculations indicating compliance with seismic resistance requirements.

D. Samples: Submit samples 12 inch length in size illustrating color and finish of exposed to view components.

1. Include metal ceiling panels, filler strips, edge moldings and each type of carrier channel for linear metal ceilings.
2. Panels shall show the full range of color and finish to be expected in the completed work
3. Submit full range of Luxacote color and finish samples for selection by the Architect when no color selection has been indicated.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

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 Linear Panels: Ten, standard length.

H. CHPS Submittal: Documentation of recycled content.

1.06 QUALITY ASSURANCE

A. Designer Qualifications for Seismic-Wind Design: Under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at California.

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.

D. Compatibility: Furnish only associated components that have been recommended by the manufacturer of the Soffit and Cladding system.

1.07 MOCK-UPS

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

B. Locate mock-up where directed.

C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.

C. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.09 WARRANTY

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

B. Manufacturer Warranty: Provide 5-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS:

A. 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 1617A.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) DSA IR A-5: Acceptance of Products, Materials, and Evaluation Reports.
        2) DSA IR 16-9: Pendant Luminaires.
        3) DSA IR 25-1: Maximum Allowable Load for Ceiling Wires.
        4) DSA IR 25-2: Suspended Lay-In Panel Ceiling; Revised 11/3/23.

2.02 MANUFACTURERS

A. Linear Metal Ceilings:

1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. USG Corporation: www.usg.com/ceilings/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LINEAR METAL CEILINGS

A. Linear Metal Ceiling and Soffit System: Panels, suspension members, trim, and accessories as required to provide a complete system.

B. Performance Requirements:

1. Design to support imposed loads of indicated items without eccentric loading of supports.
2. Design for maximum deflection of 1/360 of span.
3. Design to resist wind load required by CBC and ASCE 7.
4. Design to resist seismic load by using practices specified in ASTM E 580.
5. Surface Burning Characteristics: Class A Flame spread index of 25, smoke developed index of 50, when tested in accordance with ASTM E84.
6. Systems Located Outside Building Envelope:
    a. Accommodate wind and suction loads and wind uplift to resist minimum 40 psf without damage.

2.04 COMPONENTS

A. Linear Metal Panels:

1. Type: Linear panel with filler strips; snap-in installation.
    a. Size and Configuration: As indicated on drawings.
    b. Panel Profile: Channel shaped with square edges.
    c. Filler Strip: Manufacturer's standard recessed strip to fill space between panels.

B. Edge Molding and Splices: Same material, thickness, and finish as linear panels.

C. End Caps: Formed metal; same color and finish as sight-exposed surfaces of linear panels.

D. Accessories: Stabilizer bars as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.

E. Suspension Members: Formed steel sections, with integral attachment points; galvanized (G90) finish; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

F. Suspension Wire: Size and type as required for application, seismic requirements, and ceiling system flatness requirement specified.

G. Subgirt Members: Hot-dipped galvanized or electro-galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating; formed to resist imposed loads and to provide attachment for linear ceiling and accessories.

H. Insulation: ASTM C665, glass fiber batt, friction fit; comply with the following:

1. Facing: Unfaced.

I. Touch-up Paint For Concealed Items: Zinc rich type.

2.05 FABRICATION

A. Shop cut linear panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels ; back brace internal corners.

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.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Verify that field measurements are as indicated.

E. Commencement of work will signify acceptance of above indicated materials and surfaces as satisfactory.

3.02 INSTALLATION

A. Suspension Components:

1. Install after above-ceiling work is complete in accordance with ASTM C 636/C 636M and ASTM C 636/C 636M.
2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.
4. Locate suspension system for linear panel layout on room axis according to reflected plan.

B. Linear Metal Ceiling:

1. Install linear panels and other system components in accordance with manufacturer's instructions.
2. Align end joints.
3. Butt interior end joints tight.
4. Set exterior end joints with 1/16 inch gap for expansion and contraction.
5. Provide expansion joints to accommodate plus or minus 1 inch movement and maintain visual closure.
6. Field miter corners at changes in panel direction.
7. Install filler strips between linear panels at interior locations.
8. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
9. Install end caps at sight-exposed ends of linear panels.
10. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

C. Insulation: Install above panel members; fit tight between grid members ; place insulation with facing side down.

3.03 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.

C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.04 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

C. Removing discolorations and foreign matter, and touch up abraded spots and edges (if any) with the same paint as was used in the factory-applied finish of the ceiling components.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring. LVT-1, LVT-2, LVT-3, & LVT-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. Remedial Floor coating is required under all resilient flooring.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 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 F1700 - Standard Specification for Solid Vinyl Floor Tile.

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

F. 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.

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 persons with disabilities: 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.scscertified.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 1.2, January 2017. CalGreen 5.504.4.6.
    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 TILE FLOORING

A. (LVT) Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer.
1. Basis of Design Product: Indicated on Drawings as manufactured by Mohawk, or approved equal.
2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
4. VOC Content Limits: As specified in Section 01 61 16.
5. Wear Layer Thickness: 0.020 inch.
6. Total Thickness: 0.125 inch.
7. Color: As indicated on drawings.

2.03 RESILIENT BASE

A. Resilient Base - Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; Style B, Cove.
1. Basis of Design Product: Indicated on Drawings as manufactured by Mohawk, or approved equal.
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
3. Height: 4 inches.
4. Thickness: 0.125 inch.

5. Finish: Satin.
6. Length: Roll.
7. Color: As indicated on drawings.
8. Accessories: Premolded external corners and internal corners.

2.04 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.

B. Clean substrate.

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.

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 - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

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 no 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 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and prime painting.

B. 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 Coating Systems.

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-UPS

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

B. Provide panel, 3 panel drops wide, full height, illustrating installed wall covering and joint seaming technique.

C. Locate where directed.

D. 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. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

E. 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 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing ceiling baffles.

B. Mounting accessories.

1.02 RELATED REQUIREMENTS

A. 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.

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. Manufacturer's qualification statement.

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.

2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

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-UPS

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. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. 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.

B. Fabric-Covered Acoustical Ceiling Baffles:

1. Baffle Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
2. Core Density: 1.5 to 3.0 lb/cu ft.
3. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.80 when tested in accordance with ASTM C423 for Type J mounting, per ASTM E795.
4. Baffle Size: As indicated on Drawings.
5. Baffle Thickness: As required to meet required acoustical performance.
6. Edges: Perimeter edges reinforced by a formulated resin hardener.
7. Corners: As detailed.
8. Fabric: Woven polyester.
9. Color: As indicated on Drawings.
10. Mounting: Vertically suspended from ceiling or structure by one edge of panel.

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.
2. For panels suspended from ceiling, provide fabric covering both sides, with seams only at panel edges.

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. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.

B. Fixing Clips: Manufacturers standard for application as indicated.

C. Furring Strips: 1 by 2 inch wood furring.

D. 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.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Suspend ceiling baffles at locations and heights as indicated.

E. Furring-Mounted Cementitious Wood Fiber Panels:

1. Lay out panels vertically, with factory edges butted tight, ends occurring over firm bearing, and cut edges facing away from factory edges; attach Z-furring strips horizontally; start with J-channel furring 6 inches above finished floor, and provide 1 inch clearance along length of strip from ceiling, unless otherwise indicated.
2. Install furring strip along meeting edges of adjacent panels to ensure they are attached to same furring strip along abutted edge; 24 inches on center, maximum.
3. Install acoustic insulation between furring as indicated on drawings.
4. Adhere first panel from edge to furring strip; attach subsequent panels using fasteners.

F. 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.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 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. Materials for backpriming woodwork.

D. 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. Exterior Plaster.
3. Mechanical and Electrical:
    a. On the roof and outdoors, paint equipment exposed to weather or to view, including factory-finished materials.

E. 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. Glass.
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 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. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

E. SCAQMD 1113 - Architectural Coatings.

F. SSPC-SP 1 - Solvent Cleaning.

G. SSPC-SP 2 - Hand Tool Cleaning.

H. SSPC-SP 6/NACE No.3 - 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 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, approved by manufacturer, and with minimum three years documented experience.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 12 feet high by 8 feet wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate where directed by Architect.

1.08 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.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

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. If 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. Base Manufacturer: Dunn-Edwards Corporation.
2. Dunn-Edwards Corporation: www.dunnedwards.com/#sle.
    a. Local representative Wanda Barragan 909.261.1289.

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 described explicitly in manufacturer's product instructions.

B. No intentionally added cadmium.

C. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

D. 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.

E. Flammability: Comply with applicable code for surface burning characteristics.

F. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

G. 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 cement board 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. Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer.
   2. Semi-gloss: Two coats of latex enamel.

C. Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of latex enamel.

D. 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. Anti-Corrosive Alkyd Primer for Metal.
   3. Interior/Exterior Quick Dry Alkyd Primer for Metal.
   4. Alkyd Primer for Galvanized Metal.
   5. Water Based Primer for Galvanized Metal.
   6. Rust-Inhibitive Water Based Primer.
   7. Interior/Exterior Quick Dry Primer for Aluminum.
   8. 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 affect 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 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 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. 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.

H. 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 in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

I. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

J. 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. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

H. Sand metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. 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. Materials for backpriming woodwork.

D. 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, and insulated and exposed ducts, 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.

E. 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. Glass.
7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

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. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

F. SCAQMD 1113 - Architectural Coatings.

G. SSPC-SP 1 - Solvent Cleaning.

H. SSPC-SP 2 - Hand Tool Cleaning.

I. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning.

J. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete.

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 products to be used in project; 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 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 gal 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 experience.

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 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 fc 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. If 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. Base Manufacturer: Dunn-Edwards Corporation.

2. Dunn-Edwards Corporation: www.dunnedwards.com/#sle.
    a. Local representative Wanda Barragan 909.261.1289.

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 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. No intentionally added cadmium.

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. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
            1) Opaque, Flat: 50 g/L, maximum.
            2) Opaque, Nonflat: 150 g/L, maximum.
            3) Opaque, High Gloss: 250 g/L, maximum.
        e. 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 under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, shop primed steel, and galvanized steel.

1. Two top coats and one coat primer.
2. Top Coat(s): Interior Latex.
3. Top Coat Sheen:
    a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
    b. Eggshell: MPI gloss level 3; use this sheen at all locations.
    c. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:

1. Medium duty applications include doors, door frames, railings, handrails, and guardrails.
2. Two top coats and one coat primer.
3. Primer: As recommended by top coat manufacturer for specific substrate.

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. Studio Walls: Water-based, acrylic theatrical primer & sealant.
    a. Egg-Shell: Two Coats of Tough-Prime by Rosco Laboratories or approved equal product.
    b. Color: No. 5711 Chroma Key Green.

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. Ferrous Metals, Unprimed, Latex, 3 Coat:

1. One coat of latex primer.
2. Semi-gloss: Two coats of latex enamel.

F. Ferrous Metals, Primed, Latex, 2 Coat:

1. Touch-up with latex primer.
2. Semi-gloss: Two coats of latex enamel.

G. Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanize primer.
   2. Semi-gloss: Two coats of latex enamel.

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 Alkyd Enamel Undercoat.
   9. Stain Blocking Primer.
   10. 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 adequately 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 affect 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 is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. 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 in accordance with SSPC-SP 13/NACE No.6.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. 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.

I. 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 in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

J. 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.

K. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

L. 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 and recommendations in "MPI Architectural Painting Specification Manual".

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. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and 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.

B. District will provide 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 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

1. Exterior Steel: exterior steel, hollow metal doors and frames, and metal copings/flashings (not prefinished)

B. Surface preparation.

1.02 RELATED REQUIREMENTS

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

B. Section 09 91 13 - Exterior Painting.

C. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

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 D2486 - Standard Test Methods for Scrub Resistance of Wall Paints.

C. ASTM D4587 - Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

F. SCAQMD 1113 - Architectural Coatings.

G. SSPC-SP 1 - Solvent Cleaning.

H. SSPC-SP 2 - Hand Tool Cleaning.

I. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.

1. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review the following:

a. Environmental requirements.

b. Protection of surfaces not scheduled to be coated.

c. Surface preparation.

d. Application.

e. Repair.

f. Field quality control.

g. Cleaning.

h. Protection of coating systems.

i. One-year inspection.

j. Coordination with other work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all 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 coating 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 all substitutions proposed.

C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1. 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 coated surfaces, and color samples of each color and finish used.

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.

2. Extra Coating Materials: 1 gallon of each type and color.

3. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for general requirements for mock-ups.

B. Locate where directed.

C. Mock-up may remain as part of the work.

1.08 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 coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating 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.

1.09 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

F. Restrict traffic from area where coating is being applied or is curing.

1.10 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 bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide high performance coating products 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. High-Performance Coatings:
1. Carboline: www.carboline.com.
2. PPG Paints: www.ppgpaints.com/#sle.
   a. Local representative Susan L. Giampietro 949.410.2452.
3. Precision Coatings: www.precisioncoatingsinc.com/#sle.
4. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
   a. Local Representative: John Dumesnil, 619.665.9341.
5. Tnemec Company, Inc: www.tnemec.com/#sle.
   a. Local Representative: Tony Hobbs, 310.637.2363.
6. Substitutions: Section 01 60 00 - Product Requirements.

2.02 HIGH-PERFORMANCE COATINGS

A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
2. Lead Content: None.
3. No intentionally added cadmium.
4. Scrubbability: Excellent, when tested in accordance with ASTM D2486.
5. Gloss and Color Retention: Excellent, when tested in accordance with ASTM D4587.

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
3. Volatile Organic Compound (VOC) Content:
   a. Provide coatings that comply with the most stringent requirements specified in the following:
      1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      2) SCAQMD 1113 Rule.

3) CARB (SCM).

4) Architectural coatings VOC limits of California.

b. 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.

4. Colors: As indicated.

B. Fluoropolymer Coating for Steel Columns:

1. Number of Coats: Two.

2. Product Characteristics:

a. Percentage of solids by volume, 58.0 ± 2.0% (mixed), minimum.

b. Dry film thickness, per coat, 2.0 to 3.0 mils (50 to 75 microns), minimum.

c. Comply with the performance requirements specified above for moderate exposure.

3. Top Coat(s): Air Dry Fluoropolymer, One Component.

a. Sheen: Gloss.

b. Products:

1) Basis of Design: Tnemec Company, Inc; Series 1070V Fluoronar: www.tnemec.com/#sle.

2) Substitutions: Section 01 60 00 - Product Requirements.

4. Primer: As recommended by coating manufacturer for specific substrate.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent cover materials.

G. Proceed with coating application only after unacceptable conditions have been corrected.

1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. 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.

E. 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 in accordance with SSPC-SP 6/NACE No.3, and protect from corrosion until coated.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection.

B. District will provide field inspection.

C. Dry Film Thickness Testing: District will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.07 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards. MB-1

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI A208.1 - American National Standard for Particleboard.

C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.

D. CBC - California Building Code.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Color charts for selection of color and texture of porcelain enamel steel 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. Manufacturer's Qualification Statement.

H. 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 REGULATORY REQUIREMENTS:

A. Requirements for Persons with Disabilities: Provide products meeting requirements of California Code of Regulations (CCR), Title 24, Part 2, CBC, CBC Ch. 11B, and ADA Standards, latest amendment.

1. Operable parts for all accessible items shall comply with CBC Ch. 11B-309 Operable Parts.
2. Pull hardware shall be U-shaped wire pulls or equally accessible at all accessible casework; CBC Ch. 11B-811.4 Operable Parts.

2.02 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards: MB-1

1. Basis of Design Product: LCS Porcelain as manufactured by Claridge Products and Equipment, Inc, or approved equal.
2. Color: White.
3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
4. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
5. Backing: Aluminum foil, laminated to core.
6. Size: As indicated on drawings.
7. Frame: Extruded aluminum , with concealed fasteners.
8. Frame Profile: As indicated on drawings.
9. Frame Finish: Anodized, natural.
10. Accessories: Provide marker tray, map rail, and flag holder.

B. 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. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

D. 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, concealed fasteners, same finish as frame.

G. Mounting Brackets: Concealed.

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.

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.

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, wall switches, and outlets.

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 about 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 Final Inspection.

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 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 - 2010 ADA Standards for Accessible Design.

C. CBC Chapter 11B - California Building Code-Chapter 11B.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:

1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Verification Samples: Submit samples showing colors and finishes specified.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:
   1. ASI Sign Systems, Inc.: www.asisignage.com.
   2. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com.
   3. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
   4. Gemini, Inc.: geminimade.com.
   5. Inpro Corporation: www.inprocorp.com/#sle.
   6. Metallic Arts: www.metallicarts.com.
   7. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and CBC Chapter 11B, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Stainless steel sheet, flat.
   2. Thickness: Manufacturer's standard for letter size.
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font: As indicated on Drawings.
   5. Finish: As selected by Architect from manufacturer's full range.
   6. Color: As selected.
   7. Mounting: Concealed screws.

2.04 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel or galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards, CBC Chapter 11B, and applicable building codes.

D. Protect from damage until final inspection; repair or replace damaged items.

END OF SECTION

SECTION 10 14 23
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

B. Traffic and parking control, and site informational signage

1.02 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 - 2010 ADA Standards for Accessible Design.

D. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.

E. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

G. CBC - California Building Code.

H. CBC Ch. 11B - California Building Code-Chapter 11B.

I. CBC Chapter 11B - California Building Code-Chapter 11B.

J. NFPA 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:

1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.

2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

   a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.

   b. 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.

   c. 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, indicating sign style, font, and method of attachment.

E. Verification Samples: Submit samples showing colors, materials, and finishes specified.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's qualification statement.

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.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 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 under cover and elevated above grade.

D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:

1. ASI Sign Systems, Inc.: www.asisignage.com.
2. Best Sign Systems, Inc: www.bestsigns.com/#sle.
3. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
4. Inpro Corporation: www.inprocorp.com/#sle.
5. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
6. Seton Identification Products: www.seton.com/aec/#sle.
7. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards, CBC Chapter 11B, and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

1. Requirements for Persons with Disabilities: Provide identifying devices meeting the requirements for persons with disabilities 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.
    c. Accessible Means of Egress Signage: CBC 1009.
        1) Directional Signage: CBC 1009.10.
            (a) Provide directional signage complying with CBC Ch. 11B-703.5 indicating the location of all other means of egress and which are accessible means of egress:
                (1) At exits serving a required accessible space but not providing an approved accessible means of egress.
2. Raised characters: Comply with CBC Ch. 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 Ch. 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 Ch. 11B-703.5.1
    d. Proportions: It shall be selected from fonts where the width of the uppercase letter "0" 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 Ch. 11B-703.2.4 and 11B-703.2.6; If characters are both visual and raised, provide stroke width min. 10% and maximum 15% of the character "I". CBC Ch. 11B 703.5.7.
    e. Character Spacing: Spacing between individual tactile characters shall comply with CBC Ch. 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 Ch. 11B-703.2.9.
    g. Braille: It shall be contracted (Grade 2) and shall comply with CBC Ch. 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. Duplicate all characters on sign.
    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 Ch. 11B and Figure 11B-703.4.1.
    i. Mounting location: A tactile sign shall be located per CBC Ch. 11B 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 leafs.
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 leafs.
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.

3. Visual characters shall comply with CBC Ch. 11B -703.5 and shall be 40 inches minimum above finish floor or ground.
   a. 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
   b. Character height shall be determined based upon height above ground and horizontal viewing distance per CBC Table 11B-703.5.5.
   c. Proportions for Visual Characters 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 shall be 10% minimum and 20% maximum of the height of the character. CBC Sections 11B-703.5.4 and 11B-703.5.7
   d. Spacing between separate lines of characters shall comply with CBC Section 11B-703.5.9

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room and door signs.
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: As indicated on drawings.
   4. Total Thickness: 1/8 inch.
   5. Sign Edges: Squared.
   6. Letter Edges: Squared.
   7. Corners: Squared.
   8. Color and Font, unless otherwise indicated:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper and lower case (title case).
      c. Background Color: As scheduled.
      d. Character Color: Contrasting color.
   9. Material: Laminated colored plastic engraved through face to expose core as background color.
   10. Profile: Flat panel in aluminum frame.

a. Frame Finish: Black anodized.

11. Tactile Letters: Raised 1/32 inch minimum.
12. Braille: Grade II, ADA-compliant.
13. One-Sided Wall Mounting: Concealed screws.

2.04 SIGNAGE APPLICATIONS

A. Room and Door Signs:

1. 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 Ch. 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 Ch. 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 Ch. 11B-216.8.1 at the entrances to toilet and bathing rooms.
      2) Comply with CBC Ch. 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 (All Gender): 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.
            (1) No pictogram is to be provided.
         (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.
2. Exits: Provide raised character and Braille exit signs per CBC Section 1013.4 at the following locations:

Text	**Location**
EXIT	Grade level exit door.
EXIT STAIR DOWN, EXIT STAIR UP	Exit door to exit stair.

EXIT RAMP DOWN, EXIT RAMP UP	Exit door to exit ramp.
EXIT ROUTE	Exit door to exit enclosure, exit passageway, exit corridor, or exit hallway.
TO EXIT	Exit door to horizontal exit.
EXIT WITH ALARM	Exit doors with an alarm.
EXIT ONLY or EXIT STAIR ONLY	Exit doors and stair exit doors which lock from outside and does not allow a return

B. Interior Directional and Informational Panel Signs:

1. Assistive Listening Devices, include International Symbol of Access for Hearing Loss complying with CBC Ch. 11B Figure 11B-703.7.2.4..
    a. Include International Symbol of Access for Hearing Loss, CBC Ch. 11B Figure 11B-703.7.2.4, with text “Assistive-Listening System Available”. Use upper and lower case characters.
2. Occupant Load Signs:
    a. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.
    b. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.
    c. Sign to read: “MAXIMUM OCCUPANCY LOAD XXX”. Indicate occupant load shown on drawings.

C. Traffic Signs: To match campus standards; locate where indicated on drawings.

1. Manufacturers:
    a. Hawkins Traffic Safety Supply, Inc.: www.hawkinstraffic.com.
    b. Safeway Sign Company: www.safewaysign.com.
    c. Western Highway Products, Inc.: www.westernhighway.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.
2. 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.
    a. Parking Stall Signs: Sign text, accessible parking control shall comply with requirements of State of California Code of Regulations (CCR) - Title 24, Part 2, CBC Ch. 11B-502.6 in addition to requirements of State of California, Department of Transportation (CALTRANS) and regulations of local authorities having jurisdiction.
        1) 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.

(a) Provide an additional sign below the accessible sign with the text "Minimum Fine $250".

2) Position one sign at the end of each parking space designated for accessible parking.

3) One in every six spaces (CBC Ch. 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 Ch. 11B-502.6, 36 CFR 1191, and ADA Standards.

4) 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.

b. Additional signs, with content as indicated on Drawings.

c. Fire Lane Signs:

1) Single post mount, of size, color and sign text as shown on site plan or as required by local codes and fire department authority.

2) Quantity, location and mounting heights to be determined by local fire department authority.

d. Fire Safety Signage:

1) Provide sign, types, shapes, and content as indicated on Drawings and as required for products in-use, stored, and installed.

2) Comply with OSHA 29 CFR 1910.145, NFPA 704, ANSI Z535.2, ANSI Z535.4, and California Fire Code.

3. Support Posts:

a. Galvanized steel pipe, minimum 2-1/2 inch diameter or as indicated, with caps.

b. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.

4. Accessories: Provide welded galvanized steel fittings and galvanized or stainless steel bolts, nuts and washers.

5. Fasteners: Provide tamper-proof galvanized steel fasteners.

a. Tufnut System (714) 962-5838, Allegheny Bolt (Tampruf brand; (516) 568-1052 or equal.

2.05 FABRICATION

A. Provide signs and supports factory-prefabricated and pre-finished, ready for assembly and installation.

2.06 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION AT BUILDING

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards, CBC Chapter 11B, and applicable building codes.

1. Room and Door Signs: Locate on wall at latch side of door (per CBC Ch. 11B-703.4.2) 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 Ch. 11B-703.4.1 and CBC Ch. 11B -703.4.2

D. Protect from damage until final inspection; repair or replace damaged items.

3.03 SITE AND TRAFFIC SIGN INSTALLATION

A. Locate informational signage as verified in field by District. Verify and coordinate sign locations to prevent conflict with underground utilities.

B. 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.

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. Set sign support post plumb and so sign face will be perpendicular to stall or parallel to curb face, as applicable.

    a. Set posts into pipe sleeve inserts set and anchored into concrete.

    b. Fill annular space between posts and sleeves with grouting compound.

2. Signs set in asphaltic paving surfaces or concrete sidewalks shall be mounted in core drilled holes minimum 8 inch diameter, 18 inchesdeep with top of base flush to finish.

3. Firmly attach signs mounted to walls with appropriate expansion anchors or bolting, adhesive not permitted.

4. Seal all holes water tight.

E. Install plaque signage to posts, with panel facing traffic as necessary.

3.04 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 and Procedures.

B. Inspect signs for information content, appearance, location and Braille:

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 Ch. 11B-703.1.1.2.

a. Inspection includes, 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) Sanitary facilities signage per CBC Ch. 11B-216.8 Toilet rooms and bathing rooms; and CBC Ch. 11B-703.7.2.6 Toilet and bathing facilities geometric symbols.

3) Tactile exit signage per CBC 1013.4 and CBC Ch. 11B-216.4.1 Exit doors.

3.05 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 43
PHOTOLUMINESCENT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Photoluminescent signs.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM E2072 - Standard Specification for Photoluminescent (Phosphorescent) Safety Markings.

C. CBC - California Building Code.

D. CBC Chapter 11B - California Building Code-Chapter 11B.

E. NFPA 170 - Standard for Fire Safety and Emergency Symbols.

F. UL 924 - Emergency Lighting and Power Equipment.

G. UL 1994 - Luminous Egress Path Marking Systems.

1.03 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, and overall dimensions of each sign.

C. Shop Drawings: Indicate dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Samples: Submit two samples of each type of photoluminescent sign, of size similar to that required for project, indicating style, font, and method of attachment.

E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

F. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package photoluminescent signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards, CBC Chapter 11B, and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.02 PHOTOLUMINESCENT SIGNS

A. Photoluminescent Signage for Floor Level Exit Signs at A and E Occupancies:

1. Comply with CBC 1013.5 and 1013.7 Floor Level Exit Signs.
2. Comply with NFPA 170, UL 1994, and ASTM E2072. Listing: UL 924.
3. California State Fire Marshal Approval: Yes.
4. Application: Directional.
5. Size: 14.25 inches by 7.5 inches, Nominal.
6. Thickness: 0.32 inch.
7. Mounting: Wall mounted.
8. Mounting Bracket: Anodized aluminum; Wall mount, dual facing where indicated on Drawings.
9. Visibility Rating: 50 feet.
10. Graphics: 6 inches high.
    a. Comply with CBC 1013.6.1.
    b. Letter color: Green with red outline.
11. Symbol: Chevron.
12. Material: Photoluminescent pigment on powder coated aluminum substrate.
13. Vandal Resistant.
14. Warranty: 30 Years.
15. Products:
    a. Basis of Design Product: Exit Sign, FRUL-050-B as manufactured by NightBright USA, nightbrightusa.com, or approved equal.
    b. Active Safety; ECO-CLEAR Series 2003: www.activesafety.com.
    c. ELCO Lighting; EE80S Self Illuminating Exit Sign (Green Letters): elcolighting.com.
    d. Safe-T-Nose, LLC; Photoluminescent Exit Sign (EUL50): www.safetnose.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate photoluminescent signs and mount at heights indicated on drawings and in accordance with ADA Standards, CBC Chapter 10, and CBC Chapter 11B.

D. Protect from damage until final inspection; repair or replace damaged items.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bumper rails.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Anchors for attachment of work of this section, concealed in wall.

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. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two sections of bumper rails, 24 inches long.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bumper Rails:

1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
2. Inpro: www.inprocorp.com/#sle.
3. Koroseal Interior Products: www.koroseal.com/#sle.
4. 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. Bumper Rails: Factory- or shop-fabricated, with preformed end caps and internal and external corners:

1. Performance of Installed Assembly:
   a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
   b. Resist lateral force of 250 lbs at any point without damage or permanent set.
2. Material: Wood; solid maple.
   a. Wood finish: Manufacturer's standard shop-applied transparent finish, with stain selected from manufacturer's standards.
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. Mounting: Surface.
5. Projection From Wall to Outside of Rail: 3 inch.

6. Clear Space From Wall: 1-1/2 inch.
7. Return rail to wall.
8. Length: Minimum one piece length not less than 72 inches; flush splicing.

B. Adhesives and Primers: As recommended by manufacturer.

C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

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. 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 top of bumper rail 36 inches from finished floor.

C. Terminate rails 1 inch short of door openings and intersecting walls.

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 11 52 16
AUDIO-VIDEO EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall mounted television support.

1.02 RELATED SECTIONS

A. Section 09 21 16 - Gypsum Board Assemblies.

B. Section 09 51 00 - Acoustical Ceilings.

C. Section 11 52 13 - Projection Screens.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. CAC - Part 1, Title 24 CCR - California Administrative Code.

1.04 SUBMITTALS

A. Submit product data showing dimensions, finish, and accessories.

B. Submit shop drawings showing case dimensions, mounting requirements and materials.

C. Submit manufacturer's installation instructions indicating installation procedures and component installation sequence, clearances and tolerances from adjacent construction and maintenance.

1.05 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Shop Drawings.

1.06 COORDINATION

A. Coordinate the work with ceiling construction.

1.07 REGULATORY REQUIREMENTS - DSA APPROVAL

A. Manufacturer shall furnish Architect complete Shop Drawings and calculations as specified, certified and stamped by Structural Engineer currently licensed in California. Manufacturer shall employ and pay Engineer for Certification of Drawings and Calculations.

B. Architect will submit drawings and calculations to the DSA and approval prior to fabrication.

PART 2 - PRODUCTS

2.01 FIRE CLASSIFICATION REQUIREMENTS

A. All materials shall be non-flammable or treated with a flame retardant solution approved by the State Fire Marshal in accordance with Subchapter 8, Chapter 1, Title 19, CAC.

B. ASTM E84: All materials shall have flame spread of less than 25 and smoke developed of less than 450.

2.02 WALL MOUNTED TELEVISION SUPPORT

A. Fixed Tilting Wall Support:
   1. Basis of Design Product: Model #P2642T, P4263T, P5080T, P4263TP, depending on 85 inch TV/Monitor OFCI selection as manufactured by Premier Mounts, or approved equal.
   2. Low-profile tilting mount for flat-panel displays from 130 lbs to up to 300 lb.
   3. ADA Compliant: Ability to hold displays less than 2 inches from the wall.
   4. OSHPD approved.
   5. Downward Tilt: 8-10° continuous .
   6. Post installation leveling system.
   7. Locking security barrel,
   8. Mounting Pattern: Standard VESA patterns.
   9. Accessories:
      a. Basis of Design Product: In-Wall A/V and Power GearBox model GB-INWAVPB as manufactured by Premier Mounts, or approved equal.

B. Single Source Responsibility: Provide like components and materials specified in this section from a single manufacturer.

C. Manufacturers:
   1. Draper inc.:www.draperinc.com.
   2. Legrand AV Inc.; Chief Brand or Sanus Brand: www.legrandav.com.
   3. Premier Mounts: www.premiermounts.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer=s instructions prior to universal projector mount installation.
   1. Inform Consultant of unacceptable conditions immediately upon discovery.
      a. Proceed with installation only after unacceptable conditions have been remedied.

3.02 PREPARATION

A. Verify that mounting surface is capable of supporting a static load of four times the combined weight of the projector and the mount.

B. Remove projector mount assembly contents from carton and verify that there are no damaged or missing parts.

C. Surface Preparation: Prepare surface in accordance with manufacturer=s written recommendations.

3.03 INSTALLATION

A. Coordinate installation of universal projector mount in accordance with construction details, manufacturer's installation instructions and reviewed shop drawings at locations and heights indicated.

B. Coordinate universal projector mount work with work of other trades for proper time and sequence to avoid construction delays.

C. Install universal projector mount plumb and level to supporting substrate.

D. Replace non-secure screws with security screws.

E. Accurately fit, align, securely fasten and install free from distortion or defects.

3.04 ADJUSTING

A. Adjust components and systems for correct function and operation in accordance with manufacturer=s written instructions.

1. Verify that roll adjusts to plus or minus 20 degrees as designed and to meet project requirements.
2. Verify that pitch adjusts to plus or minus 15 degrees as designed and to meet project requirements.
3. Verify that mount operates with 360 degrees of swivel as designed and to meet project requirements

3.05 CLEANING

A. Upon completion, remove surplus materials, rubbish, tools and equipment.

B. Waste Management:

1. Coordinate recycling of waste materials with section for Construction Waste Management and Disposal.
2. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
3. Remove recycling containers and bins from site.

3.06 PROTECTION

A. Protect installed product from damage during construction.

B. Repair damage to adjacent materials caused by universal projector mount installation.

3.07 ADJUSTING, CLEANING AND PROTECTION

A. Adjusting: Make required adjustments for smooth operation, free of binding, squeaking and unnecessary rattling.

B. Cleaning: Clean exposed components prior to Acceptance.

C. Protection: Protect audio-visual equipment mounts from unauthorized use, marring and soiling until Acceptance.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. CBC Ch. 11B - California Building Code-Chapter 11B.

D. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

G. WCMA A100.1 - Standard for Safety of Window Covering Products.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

C. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in District's name and registered with manufacturer.

L. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.

1. Manufacturer's authorized representative.
2. Factory training and demonstrated experience.

1.07 MOCK-UP

A. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.

1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
2. Full-sized mock-up may become part of the final installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.09 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

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

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.
2. Fabric: One year.
3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:

1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   a. Local Contact: Kathy Greenway. 951.304.9286.
2. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.
3. Manual Window Shade Controls:
   a. Unless where exempt per CBC Chapter 11B-203.9 Employee Workstations, manual window shade controls in classrooms, assemblies and other areas are required to accessible per CBC Ch. 11B-205 Operable Parts.
4. Operation to comply with CBC Ch. 11B-309 Operable Parts.
   a. Operable parts and controls at unobstructed forward and side approach shall be located within 48" a.f.f. to top of device. For reach requirements at other conditions, comply with CBC Ch. 11B-308 as they apply.
   b. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist and shall have a maximum operable force of 5 lbs.
   c. Operable parts shall also comply with CBC Ch. 11B-308.2, 11B-308.3. and 11B-309.4.

B. Interior Roller Shades - Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.

1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
   a. Drop Position: Regular roll.
   b. Mounting: Wall mounted.
   c. Size: As indicated on drawings.

d. Fabric: As indicated under Shade Fabric article.

2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Hardware Type: Universal brackets.
3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
   a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize double-sided adhesive tape.
   d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
   a. Style: Closed pocket; aluminum elliptical slat inside pocket with heat-sealed ends.
5. Manual Operation:
   a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
   b. Drive Chain: Continuous loop, stainless steel, beaded ball chain, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.
      1) Polyester Chain Color: Ivory.
   c. Shade Lift Assistance: Manufacturer's standard spring device contained in the idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
   d. Chain Retainer:
      1) Chain tensioning device complying with WCMA A100.1.
6. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; clear anodized finish.
      1) Color: White.
   b. End Cap Covers: Match fascia or headbox finish.
   c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Manufacturers:
      a. Phifer, Inc; Style 2410 3%: www.phifer.com/#sle.

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

c. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2. Material: Vinyl coated polyester.

3. Performance Requirements:

a. California Code of Regulations, Title 19 Section 3.08. Provide a nonflammable material, or treated and maintained in a flame-retardant condition by means of a flame-retardant solution or process approved by the State Fire Marshal, as set forth in California Code of Regulations, Title 19, Division 1, Chapter 8

b. Fire Performance: Class A per ASTM E84 or UL 723 Comply with CBC Section 803 and 806; Class A per NFPA 286,

c. Flammability: Pass NFPA 701 large and small tests.

d. Fungal Resistance: No growth when tested in accordance with ASTM G21.

4. Openness Factor: 3%.

5. Roll Width: 72 inches.

6. Color: As inidcated on Drawings.

7. Fabrication:

a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

b. Battens: Full width of shade, enclose in welded shade fabric pocket.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.

1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.

2. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to District.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

C. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.07 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinetwork. QC-1

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

D. CBC Ch. 11B - California Building Code-Chapter 11B.

E. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.

F. NEMA LD 3 - High-Pressure Decorative Laminates.

G. PS 1 - Structural Plywood.

H. WI (CCP) - Certified Compliance Program (CCP).

I. WI (MCP) - Monitored Compliance Program (MCP).

1.03 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. Installer's qualification statement.

I. Installation Instructions: Manufacturer's installation instructions and recommendations.

J. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 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. Comply with WI (CCP) 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 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. Provide a Woodwork Institute Certified Compliance Label on each Plastic Laminate, Solid Surface, and Solid Phenolic Core countertop.
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.

1.05 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.

1.06 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.

1.07 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.

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. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.

1. Flat Sheet Thickness: 3/4 inch, minimum.
2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
    a. QC-1 Basis of Design Product: CaesarStone as manufactured by US Quartz Products Inc. (CaesarStone U.S.A., Inc.), www.caesarstoneus.com, or approved equal.
    b. Manufacturers:
        1) DuPont Corporation; Zodiac: www2.dupont.com.
        2) LG Hausys; HI-MACS Quartz Surface: www.lghausys.com.
        3) Seieffe Corporation; OKITE®: www.okite.us/#sle.
        4) US Quartz Products Inc. (CaesarStone U.S.A., Inc.); Ceasarstone: www.caesarstoneus.com
        5) Or Equal Substitutions: See Section 01 60 00 - Product Requirements.
    c. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA (DSDM).
    d. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    e. Finish on Exposed Surfaces: Polished.
    f. Color and Pattern: As indicated on drawings.
3. Other Components Thickness: 3/4 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on drawings.
7. Fabricate in accordance with manufacturer's standard requirements.

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. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

1. Quartz / Resin Surfacing:

a. Mounting Adhesives:

1) Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.

2) Acceptable Silicone Manufacturers:

(a) Dow Corning

(b) GE Sealants and Adhesives.

(c) Substitutions: See Section 01 60 00 - Product Requirements.

3) Acceptable Epoxy Manufacturers:

(a) Akemi North America.

(b) Bonstone Material Corporation.

(c) Tenax USA.

4) Provide spacers, if required, of type recommended by adhesive manufacturer.

C. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.

D. 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.

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. Heights and clearances are to conform to ADA Standards and CBC Ch. 11B.
3. 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. 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.

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.

END OF SECTION

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions

surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and

mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
c. Include all pertinent construction, installation, performance and technical data.
d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

    1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.11 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.12 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment,

or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 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. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.
f. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bronze ball valves.
   2. Ductile-iron, single-flange butterfly valves.
   3. Bronze lift check valves.
   4. Bronze swing check valves.
   5. Bronze gate valves.
   6. Iron gate valves
   7. Manual circuit balancing valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene diene terpolymer 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.

G. SWP: Steam working pressure.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of

switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 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-G and NSF-372 for valve materials for potable-water service.

1. Valves for domestic water must comply with the Federal Reduction of Lead in Drinking Water Act.
   a. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%.
   b. All valves must be 3rd party certified.
   c. Bronze valves shall be made of dezincification-resistant material.

1.12 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, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. 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.

1.13 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.14 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.15 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Piping systems shall be supplied with valves arranged so as to give complete and regulating control of each building and piping systems throughout the building, and located so all parts are easily accessible and maintained.

1. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems.
2. Sizes: Same size as upstream pipe, unless otherwise indicated.
3. Extended stems: Where piping insulation is indicated or specified, valves shall be equipped with 2” extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops, which are fully adjustable after insulation is applied.
4. End Connection: 2 inch and under shall be threaded, 2-1/2 inches and larger shall be flanged or full lug style.

C. Valves for Potable Water must comply with California Lead Free Law, effective January 1, 2010.

1. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%. Source: California Health & Safety Code (116875).
2. All valves must be 3rd party certified.
3. Bronze valves shall be made with dezincification-resistant material.

D. Where possible, valves of one manufacturer shall be used.

E. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.

F. Bronze valves shall be made with dezincification-resistant materials, (Bronze ASTM B62, B61, or B584 Alloy C87850). This includes body, ball, stem and / or trim.

G. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

H. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

I. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

J. Valve Sizes: Same as upstream piping unless otherwise indicated.

K. Valve Actuator Types:

1. Hand-wheel: For valves other than quarter-turn types.
2. Hand-lever: For quarter-turn valves NPS 6 and smaller.

L. Valves in Insulated Piping: With 2-inch 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 and memory stops that are fully adjustable after insulation is applied.

a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Nib-seal handle extension or comparable product by one of the following:

b. General valves:

1) NIBCO
2) Hammond
3) Milwaukee

c. Below grade domestic water shut-off valves (gate valves) 2" and larger:

1) NIBCO.
2) Clow.
3) Mueller.

d. Butterfly Valves:

1) NIBCO.
2) Demco.
3) Dezuric.

e. Plug Valves:

1) Hammond.
2) Milwaukee.

f. Check valves, lift type:

1) Hammond.
2) Milwaukee.

g. Below grade backwater valve isolation valves:

1) NIBCO.
2) Clow.
3) Mueller.

2. Butterfly Valves: With extended neck.

M. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves, ASME B16.5 for steel valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

N. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-595-Y-66-LF or T-595-Y-66-LF or a comparable product by one of the following,

a. Milwaukee Valve Company.
b. Apollo.

2. Description:

c. Standard: MSS SP-110, NSF 61-G.
d. CWP Rating: 600 psig.

e. Body Design: Three piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
f. Body Material: Bronze ASTM B 584 Alloy C87850 or C87600.
g. Ends: Threaded or Solder.
h. Seats: PTFE or TFE.
i. Stem: 316 Stainless steel.
j. Ball: 316 Stainless steel, vented.
k. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-585-66-LF or T-585-66-LF or a comparable product by one of the following:

a. Conbraco Industries, Inc.; Apollo Div.
b. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110, NSF 61-G.
b. CWP Rating: 600 psig.
c. Body Design: Two piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
d. Body Material: Bronze ASTM B 584 Alloy C87600.
e. Ends: Threaded or Solder.
f. Seats: PTFE or TFE.
g. Stem: 316 Stainless steel.
h. Ball: 316 Stainless steel, vented.
i. Port: Full.

C. 200 CWP, Sizes 2-1/2" – 24", Ductile Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model LD-2000-3/5, or a comparable product by one of the following:

a. Cooper Cameron Corp.; Cooper Cameron Valves Div.
b. Tyco International, Ltd.; Tyco Valves & Controls

2. Description:

a. Standard: MSS SP-67, Type I, IAPMO.
b. NPS 24 (DN 300) and Smaller CWP Rating: 200 psig (1380 kPa).
c. Body Design: Full Lug type; Bubble tight shutoff, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.

g. Disc: Aluminum bronze

D. Retain one or more of six paragraphs in this article if iron, single-flange butterfly valves are required. MSS SP-67 covers iron, single-flange butterfly valves NPS 1-1/2 to NPS 72.

2.3 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-480-Y-LF or T-480-Y-LF or a comparable product by one of the following:

   a. Hammond.
   b. Milwaukee.

2. Description:

   a. Standard: MSS SP-80, Type 2, NSF 61-G.
   b. CWP Rating: 200 psig.
   c. Body Design: Vertical flow.
   d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
   e. Ends: Threaded or Solder.
   f. Disc: PTFE, or TFE.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-413-Y-LF or T-413-Y-LF or a comparable product by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Powell Valves.

2. Description:

   a. Standard: MSS SP-80, Type 4, NSF 61-G.
   b. CWP Rating: 200 psig.
   c. Body Design: Y-pattern Horizontal flow.
   d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
   e. Ends: Threaded or Solder.
   f. Disc: PTFE or TFE.

2.5 BRONZE GATE VALVES

A. NRS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-113-LF or T-113-LF or a comparable product by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Powell Valves.

2. Description:

    a. Standard: MSS SP-139, Type 2, NSF 61-G.
    b. CWP Rating: 200 psig.
    c. Body Material: ASTM B 584, dezincification-resistant bronze with integral seat and threaded bonnet.
    d. Ends: Threaded or Solder.
    e. Stem: Lead free Silicon Bronze.
    f. Disc: Solid wedge; lead free bronze.
    g. Packing: Asbestos free.
    h. Handwheel: Malleable iron.

B. RS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-111-LF or T-111-LF or a comparable product by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Powell Valves

2. Description:
    a. Standard: MSS SP-80, Type 2, NSF 61-G.
    b. CWP Rating: 200 psig.
    c. Body Material: ASTM B584 C87850 dezincification resistant bronze with integral seat and threaded bonnet.
    d. Ends: Threaded or Solder.
    e. Stem: Lead free silicon bronze.
    f. Disc: Solid wedge, lead free bronze.
    g. Packing: Asbestos free.
    h. Handwhell: Malleable iron.

2.6 IRON GATE VALVES

A. Class 125, Ductile-Iron Resilient Wedge Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide American Series 2500.

2. Description:

    a. Standard: AWWA C-515,
    b. CWP Rating: 250 psig.
    c. Body Material: ASTM A536 ductile iron, fusion-bonded epoxy coating inside and out.
    d. Ends: Flanged.
    e. Trim: stainless steel.
    f. Disc: Rubber encapsulated ductile iron wedge.
    g. Packing and Gasket: Asbestos free.

4.2 MANUAL CIRCUIT BALANCING VALVES

A. Bronze, Fixed Orifice, Balancing Valves (2" and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-1810-LF or a comparable product by one of the following:

    a. Or approved equal

2. Description:

    a. CWP Rating: 300 psig
    b. Maximum Operating Temperature: 260°F.
    c. Body Material: Bronze or dezincification-resistant brass, lead free, Y-pattern globe type with fixed orifice (venture) for precise regulation and control. NO QUARTER TURN VALVES WILL BE ACCEPTED.
    d. Plug: Bronze or dezincification-resistant brass with EPDM O-Rings.
    e. Seat: Bronze or dezincification-resistant brass.
    f. Ends: Threaded or Solder.
    g. Pressure Gage Connections: Shall have two metering test ports with internal check and protective caps for use with portable differential pressure metering stations.
    h. Handle Style: Calibrated hand wheel equipped with visual position readout and hidden memory stops for repeatable regulation and control.

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves (2-1/2" and larger):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F/G 737A or a comparable product by one of the following:

    a. Tour & Andersson

2. Description:

    a. CWP Rating: 240 psig

b. Maximum Operating Temperature: 250°F.
c. Body Material: Cast-iron or steel body, globe pattern with calibrated orifice. NO BUTTERFLY VALVES.
d. Stem Seals: EPDM O-Rings
e. Disc: EPDM coated cast-iron disc.
f. Seat: Bronze or dezincification brass.
g. Ends: Flanged or grooved.
h. Pressure Gage Connection: Integral seals for portable differential pressure meter.
i. Handle Style: Calibrated hand wheel equipped with visual position readout and concealed memory stops for repeatable regulation and control.

PART 3 - EXECUTION

5.1 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.

5.2 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. Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

5.3 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.

5.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Ball or Butterfly valves.

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 and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.

5.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: Threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.
4. Bronze Swing Check Valves: Class 150, nonmetallic TFE disc.
5. Bronze Gate Valves: Class 150, RS.

B. Pipe NPS 2-1/2 and Larger:

1. Ductile-Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

END OF SECTION 22 05 23

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 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.

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of

switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.12 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.13 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.14 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.15 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Pipe Supports: Unless otherwise indicated on the drawings, shall be as follows:

A. The Contractor shall furnish and install all miscellaneous iron work including angles, channels, etc., required to appropriately support the various piping systems. Hanger spacing and location shall conform to 2019 California Plumbing Code Table 313.1.

B. All horizontal runs of piping within the building to be supported from the structural framing with steel rods and split ring hangers, B-Line, Grinnell Company, Tolco, or approved equal.

Steel rods shall be secured to overhead framing with side beam connectors. Where necessary, install angle iron between framing to accommodate hanger rods. Where several pipes are running together, Unistrut, B-Line or Powerstrut channels with clamps may be used in lieu of individual pipe hangers, and supported from structure as herein specified. Submit test data for type of hanger supports to be provided. For support conditions other than specified herein, the Contractor shall submit method of support for approval prior to any installation.

C. Horizontal Piping Hangers and Supports:

1. General: Provide factory fabricated horizontal hangers and supports complying with one of the following MSS types listed to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

   a. Adjustable Steel Clevis Hangers: (MSS Type 1.) B-Line B 3100
   b. Adjustable Swivel Pipe Rings: (MSS Type 5) B-Line B3690

D. Vertical-Piping Clamps:

1. General: Provide factory fabricated vertical-piping clamps complying with the following types listed, to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
2. Two-Bolt Riser Clamps: (MSS Type 8) B-Line B3373

E. Hanger-Rod Attachments:

1. General: Provide factory fabricated hanger-rod attachments B-Line, Tolco or approved equal, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-58 and manufacturer's published product information. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
2. Side beam eye socket, Tolco Fig. #57 for rod sizes 3/8" dia. and Tolco Fig. #25-30-251 for rod sizes 1/2" dia.

F. Building Attachments:

1. General: Provide factory fabricated building attachments, selected by Installer to suit building structural framing conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

G. Hanger Rods and Spacing shall conform to the following table:

Pipe Sizes	Spacing	Rods

2 Inch and Smaller	6 Feet	3/8 Inch
2-1/2 Inch to 3 Inch	8 Feet	1/2 Inch
4 Inch and larger	8 Feet	5/8 Inch

H. Hangers and Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 18 inches of joint. Support shall be provided at each horizontal branch connection.

I. Provide lateral bracing as manufactured by B-Line or approved equal for all piping to prevent swaying or movement in accordance with SMACNA "Guidelines for Seismic Restraints of Piping Systems". Piping smaller than indicated in the guidelines shall be provided with bracing as specified for the smallest size indicated. The entire water distribution system shall be properly braced and will not move due to the action of quick closing of valves.

J. Miscellaneous Supports, Wall Brackets, Etc.: Provide where required in accordance with the best standard practices of the trade. Submit shop drawings for all fabricated supports.

2.2 Isolators. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line vibra clamp and cushion, Super Strut, Stoneman "Trisolator", or approved equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

2.3 Shields:

A. General: Provide shields at piping hangers and supports, factory-fabricated, for all insulated piping as manufactured by Pipeshields Incorporated or approved equal. Size shields for exact fit to mate with pipe insulation.

1. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation or equal 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

2.4 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 stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.5 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.

2.6 THERMAL-HANGER SHIELD INSERTS

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

1. ERICO International Corporation.
2. PHS Industries, Inc.
3. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
4. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552 or Type II cellular glass with 100-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.7 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, stainless- 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.

2.8 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, 28-day compressive strength.

PART 3 - EXECUTION

3.1 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. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. 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.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. 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.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. 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.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. 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.

L. 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 and larger if pipe is installed on rollers.

3. 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.

4. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 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.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

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.

3.4 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.

3.5 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.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 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 attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. 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. 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.

J. 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.

K. 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. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. 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. C-Clamps (MSS Type 23): For structural shapes.
6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MSS SP-69 for trapeze pipe-hanger 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.

END OF SECTION 22 05 29

SECTION 22 05 53

IDENITIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

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.

F. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

G. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 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.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch 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.

3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, 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 or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. 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.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch 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.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 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 cover full 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 incheshigh.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch 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 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.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
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

3.1 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.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "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 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 along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: White.
b. Letter Color: Black.

2. Sanitary Waste and Storm Drainage Piping:

    a. Background Color: White.
    b. Letter Color: Black.

3.4 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, round.
    b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

    a. Cold Water: Natural.
    b. Hot Water: Natural.

3. Letter Color:

    a. Cold Water: Black.
    b. Hot Water: Black.

3.5 WARNING-TAG INSTALLATION

A. Write the required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 53

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.10 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.

1.11 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. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.15 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.

1.16 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "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.

1.17 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

2.1 INSULATION MATERIALS

A. Hot Water Pipe Insulation: All hot water supply and return piping, except exposed connections to plumbing fixtures, flanges and unions shall be insulated with ASTM C547, Class I, "Johns-Manville" "Micro-Lock" 850-APT, Owens-Corning Fiberglass Corp., ASJ/SL-11 or approved equal, 1" thick for sizes up to 1" and 1-1/2" thick for sizes 1 1/4" and larger with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2022 CMC

1. Exposed insulated piping in occupied areas and exposed outside the building shall be covered with Johns-Manville” “Zeston” 30-mil thick white PVC jacketing material per ASTM D1784 with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Jacketing shall comply with ASTM E84, and shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2022 CMC.

2. Hot water piping below slab shall have insulation protected by a 10-mil thick polyethylene plastic sleeve sealed watertight with poly vinyl chloride tape.

B. 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.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. 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.

E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

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 Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armacell LLC; Tubolit.
b. Nomaco Insulation; IMCOLOCK and NOMALOCK.

I. Condensate Pipe Insulation: All condensate piping within the building shall be insulated with "Imcoa" "Imcolock" ¾" nominal wall thickness closed-cell insulation. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2022 CMC. All joints shall be mitered and secured with black duct tape.

J. All insulation shall be continuous through supports and hangers.

K. All fixtures complying with the provisions of the Americans with Disabilities Act shall be provided with Prowrap insulation for exposed hot water pipe, tailpiece, and trap as manufactured by McGuire, and secured per manufacturers recommendations. No tape wrapping shall be permitted.

2.2 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.

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."

C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

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-96.
    b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-33.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide the following:

    a. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

2.3 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

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.

2.4 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. McGuire Manufacturing.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 2 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.

3.4 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.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. 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 078413 "Penetration Firestopping."

3.5 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. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. 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.
8. 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.
9. 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. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. 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.
4. 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.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 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 Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. 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.

D. 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.

3.7 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will 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, 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.

3.10 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.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 1” and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1” inch thick.

2. NPS 1-1/4” and Larger: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 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 the following:

a. McGuire pre-insulated trap and supply covers.

END OF SECTION 22 07 19

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.11 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.12 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.13 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 Architect no fewer than two days in advance of proposed interruption of water service.
2. Do not interrupt water service without Architect's written permission.

PART 2 - PRODUCTS

2.1 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."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. 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 or threaded ends.

F. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought copper sweat fittings ANSI B16.18 and B16.

G. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22.

H. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 VALVE ACCESSORIES AND SPECIALTIES

A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. For service shut-off valves on domestic water; for pressure regulator assemblies, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type
2. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.5 CORROSION PROTECTION:

1. General.

   a. Corrosion protection shall be provided for all below grade copper piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping, referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure, the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

2. Materials.

   a. Copper piping encasement.

1) The polywrap shall be minimum 6 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall conform to the requirements of ASTM D1248.
2) The polywrap shall be as manufactured by Northtown Company or approved equal.

b. The minimum Polywrap flat tube width for each pipe diameter shall be as follows:

Pipe Size / Type	Polywrap Flat Tube Width
½" to ¾" copper	2"
1" to 1-½ copper	3"
2" copper	4"
2-1/2" copper	5"
3" copper	6"

c. The polywrap shall be secured as specified with 2 inch wide pressure sensitive plastic tape not less than 10 mils thick.

1) Tape shall be Scotchwrap No. 50, Polyken No. 900, Tapecoat CT, Johns-Manville No. V-10 Trantex or approved equal.

d. Piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 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, 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 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. 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.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. 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.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

O. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

S. Corrosion Protection:

1. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at each joint to facilitate

installation of the poly-wrap. The bunched-up poly-wrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. The end of the poly-wrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

2. Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.
3. Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

3.3 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. 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:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. 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."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "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 2 and Smaller: 72 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3: 8 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.6 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.

3.7 PIPE AND EQUIPMENT IDENTIFICATION

A. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.

B. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

C. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.

1. All equipment shall be provided with name plate indicating all pertinent information on it

3.8 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.

        Schedule of Test Pressures:

System Tested	Gauge	Test	Duration
Water	100 PSI	Water	4 Hours

    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.

3.9 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.

3.10 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. Operate all valves during the retention period.
        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. Operate all valves during the retention period.

    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. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 OPERATION INSTRUCTION

A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture

stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

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. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

F. Aboveground domestic water piping 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 valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water-hammer arresters.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 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 withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's

representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system.

E. Domestic Water Service: The Contractor shall arrange with the serving utility company for the installation of all water meter assemblies and reduced pressure backflow devices, including the service mains and vaults, and all required appurtenances as indicated on the drawings and in accordance with serving utility standards and shall pay all costs incurred. All required capacity fees, frontage fees and inspections, shall be paid for by the Owner. Contractor shall provide necessary tap-in connections in water main for sterilizing of domestic water system. Contractor shall connect into the main water service line as indicated on the drawings. The installation shall be in accordance with the serving utility company's standards.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.15 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 OUTLET BOXES

A. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Acorn Engineering Company.
    b. IPS Corporation.

3. Mounting: Recessed.
4. Material and Finish Plastic box and faceplate.
5. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 (DN 15) or smaller copper tube outlet.
6. Supply Shutoff Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.4 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

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

    a. Precision Plumbing Products, Inc.
    b. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water-hammer arresters in water piping according to PDI-WH 201.

3.2 Access Panels:

A. Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.
   1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.
   2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.
   3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.
   4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

3.3 Yard Boxes & Vaults: For service shut-off valves on gas and domestic water; for pressure regulator assemblies and for cleanouts, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type.

3.4 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.5 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Supply-type, trap-seal primer valves.
   2. Trap-seal primer systems.

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 Section 220553 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.7 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 22 11 19

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 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 withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be

neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract

drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.13 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 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.

1.14 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.15 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.16 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.17 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 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.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. ASTM C 1540, Heavy Duty, Hubless-Piping Couplings:

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

   a. ANACO-Husky SD 4000 series.
   b. MIFAB MI-QXHUB.

2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Soil and waste piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301, ASTM A-888 or ASTM A-74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up with "Husky" SD 4000 series or “MIFAB MI-QXHUB” series stainless steel type 304 couplings and shall conform to ASTM C1540 & ASTM C564 except all above ground vent pipe fittings may be made with "Anaco" or "MIFAB" stainless steel two band couplings conforming to CISPI Standard 310.

D. Except where otherwise indicated on the plans, building sewer piping from five feet (5') outside of the building to connections at the sewer shall be PVC (polyvinyl chloride) ASTM D3034, SDR-35 sewer pipe with locked-in gasket (ASTM F477, Elastomeric Seal.

E. Grease waste piping underground shall be cast iron pipe and fittings as specified for soil and waste piping.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Cleanouts to Grade: Jay R. Smith No. 4258 or Jay R. Smith No. 4253 with X-H bronze plug and X-X-H non-skid cover with lifting device set flush with surface for concrete areas. Asphalt or nonsurfaced areas shall be installed with ring of concrete poured around the bottom flange six inches (6") below surface. Use cast iron soil pipe on cleanout risers. For cleanouts in non-traffic areas, terminate cleanout plug in concrete yard box
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Smith, Jay R. Mfg. Co.
    b. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

3. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
4. Top-Loading Classification(s): Light Duty Medium Duty Heavy Duty and Extra-Heavy Duty.
5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Yard Boxes & Vaults: For service for cleanouts, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type.

2.4 CORROSION PROTECTION

A. General.

1. Corrosion protection shall be provided for all below grade cast iron and copper piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping, referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure, the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

B. Materials.

1. Cast iron piping encasement.

a. The polywrap shall be minimum 8 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall meet or exceed the requirements of AWWA C105, ANSI A21.5 and ASTM A674.
b. The polywrap shall be as manufactured by Northtown Company or approved equal.

2. The minimum Polywrap flat tube width for each pipe diameter shall be as follows:

Pipe Size / Type	Polywrap Flat Tube Width
2” to 3” cast iron	14”
4” cast iron	16”
6” cast iron	20”
8” cast iron	24”

3. The polywrap shall be secured as specified with 2 inch wide pressure sensitive plastic tape not less than 10 mils thick.

a. Tape shall be Scotchwrap No. 50, Polyken No. 900, Tapecoat CT, Johns-Manville No. V-10 Trantex or approved equal.

4. Piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 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 coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. 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.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. 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 two 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.

L. 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.

M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. 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/A 21.5.

O. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

T. Below-grade piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts and sleeves as manufactured by Century Line.

U. Corrosion Protection:

a. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at each joint to facilitate installation of the polywrap. The bunched-up polywrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. The end of the polywrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

b. Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

c. Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

3.3 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. 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:

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.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install 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.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. 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.
4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 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. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 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. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the California Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as wellTest 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.

3.9 CLEANING AND PROTECTION

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.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

C. Aboveground, vent piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

END OF SECTION 22 13 16

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. HDPE: High-density polyethylene plastic.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.

8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 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 withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Grease interceptors.

B. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

C. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that grease interceptors**,** accessories, and components will withstand seismic forces defined in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.13 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.14 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. 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.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.15 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.16 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.17 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.18 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate size and location of roof penetrations.

1.19 MAINTENANCE MATERIAL SUBMITTALS

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. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

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

    a. Zurn
    b. JR Smith
    c. Watts

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

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

    a. Zurn
    b. JR Smith
    c. Watts

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Cast-iron soil pipe with cast-iron ferrule Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Threaded.
7. Closure: Brass plug with tapered threads.

8. Adjustable Housing Material: Cast iron with set-screws or other device.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

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

   a. Zurn
   b. JR Smith
   c. Watts

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Option for drilled-and-threaded plug in first subparagraph below is for a screw for a wall cover plate.
6. Closure: Countersunk, brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
8. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
9. Wall Access: stainless-steel wall-installation frame and cover.

2.2 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment"
2. Comply with requirements for vibration isolation devices specified in Section 22 05 48.13 "Vibration Controls for Plumbing Piping and Equipment."

B. 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.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

P. Install wood-blocking reinforcement for wall-mounting-type specialties.

Q. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
   2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Grease interceptors.

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 Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   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.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain grease removal devices. Refer to Section 01 79 00 "Demonstration and Training."

END OF SECTION 22 13 19

SECTION 22 16 16

CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Single-Wall Piping Pressure Rating: 10-foot head of water.

A. Delegated Design: Design seismic restraints for aboveground piping, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to

have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled

"SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.11 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.12 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 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.

1.13 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.14 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.15 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.16 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 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. Indirect Waste Piping.

1. Shall be Type "L" copper as specified for water piping.

C. Air Conditioning Condensate Drain Piping.

1. Shall be Type "M" copper as specified for water piping.

2.2 COPPER TUBE AND FITTINGS:

A. Hard Copper Tube: ASTM B 88, Type M tube, drawn temper.

B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

C. 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 or threaded ends

2.3 SPECIALTY PIPE FITTINGS

A. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of condensate drain 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 condensate drain piping with 1 percent slope downward toward drain.

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 at indicated slopes.

G. 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

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Install unions in copper tubing at connection to each piece of equipment, machine, and specialty.

L. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. 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:

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.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "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 (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install 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.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. 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, with 3/8-inch minimum rods.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 72 inches with 3/8-inch rod.

2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect drainage and vent piping to the following:

1. Plumbing Specialties: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Install test tees (wall cleanouts) in conductors near floor.

3. Equipment: Connect drainage piping as indicated. Provide union for each connection.

C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

D. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed condensate drain piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 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 condensate drain 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. 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. Condensate drain piping will be considered defective if it does not pass tests and inspections

C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

3.8 CLEANING AND PROTECTION

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.

3.9 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, condensate drain piping NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type M copper, soilder-joint fittings; and soldered joints.

END OF SECTION 22 16 16

SECTION 22 33 00

ELECTRIC DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, electric, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

1.12 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.13 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.14 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.15 WARRANTY

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including storage tank and supports.
    b. Faulty operation of controls.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

    a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

        1) Storage Tank: Five years.
        2) Controls and Other Components: Two years.

    b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, domestic-WATER HEATERS

A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Chronomite Laboratories, Inc.
    b. Rheem

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

    a. Connections: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Heating Element: Resistance heating system.
    d. Temperature Control: Thermostat.
    e. Safety Control: High-temperature-limit cutoff device or system.
    f. Jacket: Aluminum or steel with enameled finish or plastic.

4. Support: Bracket for wall mounting.
5. Capacity and Characteristics:

    a. Flow Rate: 0.5 GPM at 57°F temperature rise.
    b. Temperature Setting: 110 °F.
    c. Power Demand: 4,160 watts
    d. Electrical Characteristics:

        1) Volts: 120.
        2) Phases: Single.
        3) Hertz: 60.
        4) Full-Load Amperes: 20.

2.2 domestic-WATER HEATER ACCESSORIES

A. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

B. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

D. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

E. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

F. Fill electric, domestic-water heaters with water.

G. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, electric, domestic-water heaters.

END OF SECTION 22 33 00

SECTION 22 42 13 13

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.
9. 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.
10. All single-user toilet facilities shall be identified as a Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. no pictogram, text or braille is required on the symbol. If a 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-GENER RESTROOM”, “RESTROOM’, OR “UNISEX RESTROOM”. DSA BU 17-01.
11. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

12. 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.
13. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
14. Accessible fixture controls shall comply with CBC Sections 11B-604.6 for water closets and 11B-604.9.5 for children's water closets.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 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 six of each type.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.

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.

2.2 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Sloan Valve Company.

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).

2.3 TOILET SEATS

A. Toilet Seats:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Bemis Manufacturing Company.
b. Olsonite Seat Co.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).

5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. 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.

C. Install toilet seats on water closets.

D. 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 220518 "Escutcheons for Plumbing Piping."

E. 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 079200 "Joint Sealants."

3.3 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 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 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.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 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.

3.6 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-604.6 for water closets

END OF SECTION 22 42 13 13

SECTION 22 42 16 13

COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.
9. 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.
10. All single-user toilet facilities shall be identified as a Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. no pictogram, text or braille is required on the symbol. If a 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-GENER RESTROOM”, “RESTROOM’, OR “UNISEX RESTROOM”. DSA BU 17-01.
11. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

12. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
13. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.
14. 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 an toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B606.7.
15. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of

switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.

b. Kohler Co.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Faucet-Hole Location: Top.
d. Color: White.
e. Mounting Material: Chair carrier.

3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.2 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, single-control mixing, commercial, solid-brass valve.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. 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 hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Material: Commercial, solid brass.
5. Finish: Polished chrome plate.
6. Mounting Type: Deck, exposed.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "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.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 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 220518 "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 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

G. Point of use mixing valve in cabinet to be recessed in wall, under lavatory.

3.3 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 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 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.

3.5 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.

3.6 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-606.4 for lavatories and sinks.

D. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.

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.

END OF SECTION 22 42 16 13

SECTION 22 42 16 16

COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sink faucets.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

   1. C.C.R., Title 24, Part 5 (2022 CPC).
   2. 2022 California Plumbing Code.
   3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
   4. National Fire Protection Association.
   5. California Division of the State Architect.
   6. California State Division of Industrial Safety.
   7. County Health Department.
   8. Any other legally constituted body-having jurisdiction thereof.
   9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
   10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
   11. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.
   12. 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 an toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B606.7.
   13. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built"

locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Equipment and Fixtures:

A. Fixtures:

1. See schedule on drawings.

2.2 SINKS

A. Utility Sinks: Stainless steel, counter mounted.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Elkay Manufacturing Co.
b. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Ledge back.
c. Number of Compartments: One
d. Overall Dimensions: 22 by 19 inches

e. Metal Thickness: 0.050 inch
f. Compartment:

1) Dimensions: See Plumbing Fixture Schedule
2) Drain: Grid with NPS 1-1/2 tailpiece with stopper
3) Drain Location: Centered in compartment.

3. Faucet(s): See Plumbing Fixture Schedule

a. Number Required: One.
b. Mounting: On ledge.

2.3 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual Type, Push Button.

1. Commercial, Solid-Brass Faucets.

a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following

1) 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 hole punchings; coordinate outlet with spout and sink receptor.
4. Body Material: Commercial, solid brass.
5. Finish: Chrome plated.
6. Maximum Flow Rate:

a. Sinks: 1.8 gpm.
b. Service Sinks: - gpm

7. Mounting Type: Back/wall, exposed.
8. Vacuum Breaker: Required for hose outlet.
9. Spout Outlet: Hose thread according to ASME B1.20.7.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "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.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

E. Operation: Loose Key.

2.5 SINK WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. McGuire MFG.

2. Size: NPS 1-1/2.
3. Material: Chrome-plated, seamless prewrapped cast-brass trap and swivel elbow, and chrome-plated brass or steel wall flange.

2.6 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, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

F. 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 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and 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 079200 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks 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 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

3.6 Completion of Installation:

A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.

B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.

C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.7 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-606.4 for lavatories and sinks.

D. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.

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.

END OF SECTION 22 42 16 16

SECTION 22 47 13

DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes drinking fountains and related components.

1.2 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.3 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California Division of the State Architect.
6. California State Division of Industrial Safety.
7. County Health Department.
8. Any other legally constituted body-having jurisdiction thereof.
9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
11. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.4 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.5 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:

    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    c. Include all pertinent construction, installation, performance and technical data.
    d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

        1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
        2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

    e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

    a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

        1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
    b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to

permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.11 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

1.12 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall

incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains: Stainless steel, wall mounted.

1. Stainless-Steel Drinking Fountains:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    1) Elkay Manufacturing Co.
    2) Haws Corporation.

3. Type Receptor: On horizontal support.
4. Back Panel: Stainless-steel wall plate behind drinking fountain.
5. Bubblers: Two, with adjustable stream regulator, located on deck.
6. Control: Push button.
7. Drain: Grid type with NPS 1-1/4 tailpiece.
8. Supply: NPS 3/8 with shutoff valve.
9. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 chrome-plated brass P-trap and waste.
10. Support: ASME A112.6.1M, Type III lavatory carrier.

PART 3 - EXECUTION

3.1 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.

3.2 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, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty 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 220518 "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 079200 "Joint Sealants."

3.3 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 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 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.

3.6 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children's 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.

D. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.

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.

3.7 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-601.3 for drinking fountains.

D. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.

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.

END OF SECTION 22 47 13

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Equipment installation requirements common to equipment sections.
7. Painting and finishing.
8. Concrete bases.
9. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, 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 chases.

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 plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 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 to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 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, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

C. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. 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 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 to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. 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 with spring clips.
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.
h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

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. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are 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 NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 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 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause 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. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause 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 firestop materials. Refer to Division 07 Section "Penetration Firestopping" 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.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. 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:

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. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
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.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC 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.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC 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.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 05 00

SECTION 23 05 16

EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Expansion-compensator packless expansion joints.
2. Flexible-hose packless expansion joints.
3. Grooved-joint expansion joints.
4. Pipe loops and swing connections.
5. Alignment guides and anchors.

1.2 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide 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. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Rubber, Expansion-Compensator Packless Expansion Joints:

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

    a. Mason Industries, Inc.
    b. Metraflex Company (The).
    c. Flex-Hose Co., Inc.

2. Material: Twin reinforced-rubber spheres with external restraining cables.
3. Minimum Pressure Rating: 225 psig at 170 deg F unless otherwise indicated.
4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:

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

    a. Flex-Hose Co., Inc.
    b. Mason Industries, Inc.
    c. Metraflex Company (The).
    d. Unisource Manufacturing, Inc.

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with solder-joint end connections.

a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.

2.2 GROOVED-JOINT EXPANSION JOINTS

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

1. Anvil International, Inc.
2. Shurjoint Piping Products.
3. Victaulic Company.

B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.

E. Couplings: Seven, flexible type for steel-pipe dimensions. Include ferrous housing sections, EPDM gasket suitable for cold and hot water, and bolts and nuts.

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

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

a. Flex-Hose Co., Inc.
b. Mason Industries, Inc.
c. Metraflex Company (The).

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.

2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install rubber packless expansion joints according to FSA-NMEJ-702.

C. Install grooved-joint expansion joints to grooved-end steel piping

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 23 05 16

SECTION 23 05 19

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Filled-system thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.
7. Sight flow indicators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

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

a. Ashcroft Inc.
b. Marsh Bellofram.
c. Miljoco Corporation.
d. Palmer Wahl Instrumentation Group.
e. REOTEMP Instrument Corporation.
f. Trerice, H. O. Co.
g. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal.
10. Connector Type(s): Union joint, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.
    b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus 1 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 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, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, 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.

2.4 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. Ashcroft Inc.
    c. Ernst Flow Industries.
    d. Flo Fab Inc.
    e. Marsh Bellofram.
    f. Miljoco Corporation.
    g. Noshok.
    h. Palmer Wahl Instrumentation Group.
    i. REOTEMP Instrument Corporation.
    j. Tel-Tru Manufacturing Company.
    k. Trerice, H. O. Co.
    l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    m. Weiss Instruments, Inc.
    n. WIKA Instrument Corporation - USA.
    o. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Sealed; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, 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.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Brass.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS ½, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 or NPS ½ pipe threads.

C. Valves: Brass ball, with NPS 1/4 or NPS ½, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

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

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. 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 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

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

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing two thermometers, one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.8 SIGHT FLOW INDICATORS

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

1. Archon Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Brooks Instrument.
4. Ernst Co., John C., Inc.
5. Ernst Flow Industries.
6. KOBOLD Instruments, Inc. - USA; KOBOLD Messring GmbH.
7. OPW Engineered Systems; a Dover company.
8. Penberthy; A Brand of Tyco Valves & Controls - Prophetstown.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 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. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

E. 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.

F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

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 test plugs in piping tees.

J. Install flow indicators in piping systems in accessible positions for easy viewing.

K. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

L. Install flowmeter elements in accessible positions in piping systems.

M. Install wafer-orifice flowmeter elements between pipe flanges.

N. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

O. Install permanent indicators on walls or brackets in accessible and readable positions.

P. Install connection fittings in accessible locations for attachment to portable indicators.

Q. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

R. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic coil in air-handling units.
2. Outside-, return-, supply-, and mixed-air ducts.

S. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be the following:

1. Direct-mounted, metal-case, vapor-actuated type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Air Ducts: 0 to 100 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be the following:

1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each pump shall be the following:

1. Sealed, direct-mounted, metal case.

END OF SECTION 23 05 19

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
2. Section 230548 "Vibration and Seismic Controls for HVAC for vibration isolation devices.
3. Section 233113 "Metal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 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.

1.4 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. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 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

2.1 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.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 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.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

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

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. 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 inturned 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: Electroplated zinc.

B. Non-MFMA Manufacturer Metal Framing Systems:

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

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned 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. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

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

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 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.

2.6 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. 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.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. 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: 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:

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.

F. Curb-Mounted-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.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 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, 28-day compressive strength.

PART 3 - EXECUTION

3.1 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. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. 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.

G. 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. See Section 077200 "Roof Accessories" for curbs.

H. Install hangers and supports complete with necessary attachments, 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 that 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 to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. 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 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 or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 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 and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. 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 up to 1050 deg F, pipes NPS 4 to NPS 24, 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 36, 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 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-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 or carbon-steel plate.
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 or carbon-steel plate, 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 two 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 24, 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.

K. 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.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. 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.

M. 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.

N. 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.

O. 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 allow 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 allow 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 allow 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.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Restrained-spring isolators.
3. Elastomeric hangers.
4. Spring hangers.
5. Snubbers.
6. Restraint channel bracings.
7. Restraint cables.
8. Seismic-restraint accessories.
9. Mechanical anchor bolts.
10. Adhesive anchor bolts.

1.2 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).

1.3 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 evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, 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 IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA 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

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

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

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Smooth pattern.
6. Infused nonwoven cotton or synthetic fibers.

2.2 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top plate with threaded mounting holes.

c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.3 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

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

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.4 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

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

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Kinetics Noise Control, Inc.
d. Mason Industries, Inc.
e. Vibration Eliminator Co., Inc.
f. Vibration Isolation.
g. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.5 SNUBBERS

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

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.6 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.
4. Unistrut.

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.

2.7 RESTRAINT CABLES

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

1. Kinetics Noise Control, Inc.
2. Loos & Co., Inc.
3. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.8 SEISMIC-RESTRAINT ACCESSORIES

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

1. Cooper B-Line, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. TOLCO.

B. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.9 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. Kinetics Noise Control, Inc.
4. 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

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-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.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. 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.

3.3 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 033000 "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. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. 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.

J. 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.

K. 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.

3.4 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 232113 "Hydronic Piping" for piping flexible connections.

3.5 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.
9. Test and adjust restrained-air-spring isolator controls and safeties.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 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 23 05 48

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 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

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, 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 self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, manufacturer, model 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.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, 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.

2.3 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 cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. 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 high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch 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 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.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
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

3.1 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.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in other sections.

B. 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 along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Refrigerant Piping:

a. Background Color: Orange.
b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 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 HVAC terminal devices 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. All Valve-Tags: 1-1/2 inches minimum, round.

2. Valve-Tag Color:

a. All Valve-Tags: Natural.

3. Letter Color:
a. All Valve-Tags: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. TAB: Testing, adjusting, and balancing.

C. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. TAB Conference: Meet with Owner on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. 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.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine operating safety interlocks and controls on HVAC equipment.

K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare 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 indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation" and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain 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. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.7 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.8 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.

7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. 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. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.

h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.

d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. 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:

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. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.9 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
c. Verify that balancing devices are marked with final balance position.
d. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
6. Outdoor, concealed supply and return.
7. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.2 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. 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 insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: 12 inches square.
2. Sheet Jacket Materials: 12 inches square.
3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.3 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.

1.4 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.

1.5 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.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork 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.

1.7 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

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum 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. 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 III with factory-applied FSK jacket. 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. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. 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.; Commercial Board.

b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. 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.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 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.Eagle Bridges - Marathon Industries; 225.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.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."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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-82.

b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

2.3 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.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

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-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.

5. Color: White.

2.4 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.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
   b. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

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-76.Eagle Bridges - Marathon Industries; 405.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   c. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

2.6 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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.8 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 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, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015-inch-thick, 1/2 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CHP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

3. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

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

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire.

2.10 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. 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.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. 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. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 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 duct flanges and fittings.

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 beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 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 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.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping"irestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, 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 either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins 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, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. 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.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. 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 section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, 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 either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins 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 pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. 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.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. 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 section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 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 ductwork, 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 one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.

3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Outdoor, concealed supply and return.
6. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

B. Concealed, return-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

C. Concealed, outdoor-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

D. Exposed, supply-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

E. Exposed, return-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

F. Exposed, outdoor-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Outdoor, supply-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

C. Outdoor, return-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

D. Outdoor, outdoor-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

END OF SECTION 23 07 13

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors and outdoors.
2. Refrigerant suction and hot-gas piping, indoors and outdoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.2 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. 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.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.3 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.

1.4 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.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 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.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "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.

C. Coordinate installation and testing of heat tracing.

1.7 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

2.1 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. 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.

2.2 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.

2.3 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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aeroseal.
    b. Armacell LLC; Armaflex 520 Adhesive.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

C. 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."

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 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."

2.4 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.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

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-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 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.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

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-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

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-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealants 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."

2.7 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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

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; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

   a. Factory cut and rolled to size.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
   d. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 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, Seals, and Springs.

2. 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: 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 [2 inches] [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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 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.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. 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 078413 "Penetration Firestopping."

3.5 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. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. 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.
8. 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.
9. 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. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. 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.
4. 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.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 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 Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. 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.

D. 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.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 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.

3.11 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.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 2 inches thick.

3.14 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Section 232113.13 "Underground Hydronic Piping".

3.15 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.

3.16 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. Painted Aluminum, Corrugated: 0.024 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 23 07 19

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Hot-Gas and Liquid Lines: 535 psig.

1.3 ACTION SUBMITTALS

A. 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. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.5 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."

1.6 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.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

2.2 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 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. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

J. 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 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

K. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

L. 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. Liquid lines may be installed level.

M. When brazing, 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.

N. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

O. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 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. 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.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "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 long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
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: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.5 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.

3.6 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. 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.
4. Charge system with a new filter-dryer core in charging line.

3.7 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 to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.
2. Open compressor suction and discharge valves.
3. Open refrigerant valves except bypass valves that are used for other purposes.

4. 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 23 23 00

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

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

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

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

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. 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).
    b. 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."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.7 SEISMIC-RESTRAINT DEVICES

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

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Mason Industries.
5. TOLCO; a brand of NIBCO INC.
6. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Office of Statewide Health Planning and Development for the State of California.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems" and ASCE/SEI 7.

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by the Office of Statewide Health Planning and Development for the State of California.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
b. Supply, Return, Outdoor Air, Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

G. Liner:

1. Supply and Return Air Ducts and Plenums: Fibrous glass, Type I, 1-1/2 inches thick.

2. Transfer Ducts: Fibrous glass, Type I, 2 inches thick.

H. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

   a. Velocity 1000 fpm or Lower:

      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.

   b. Velocity 1000 to 1500 fpm:

      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

   c. Velocity 1500 fpm or Higher:

      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

I. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Combination fire and smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Remote damper operators.
9. Duct-mounted access doors.
10. Flexible connectors.
11. Flexible ducts.
12. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with 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.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

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 lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

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

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2500 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 18-gage galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Plated steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Chain pulls.
4. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
5. Screen Mounting: Rear mounted.
6. Screen Material: Galvanized steel.
7. Screen Type: Bird.
8. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

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

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 16-gage, galvanized sheet steel with welded corners or mechanically attached and mounting flange.

F. Blades:

1. Multiple, 0.025-inch- thick, roll-formed alumrinum.
2. Maximum Width: 6 inches.
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted.

G. Blade Seals: Vinyl.

H. Blade Axles: Plated steel.

I. Tie Bars and Brackets:

1. Material: Galvanized steel.
2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Ball.

L. Accessories:

1. Flange on intake.
2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

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

    a. Nailor Industries Inc.
    b. Pottorff.
    c. Ruskin Company.
    d. Trox USA Inc.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 20-gage, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Plated steel.
7. Bearings:

    a. Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.6 CONTROL DAMPERS

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

    1. Greenheck Fan Corporation.
    2. Pottorff.
    3. Ruskin Company.
    4. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

    1. Hat shaped.

2. 16-gage, galvanized sheet steel.
3. Reinforced corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Opposed-blade design.
3. Aluminum.
4. 0.063 inch thick single skin.
5. Blade Edging: TPE.

E. Blade Axles: 1/2-inch- diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

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

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 16-gage, galvanized sheet steel.

I. Leakage: Class II.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 0.039-inch-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

L. Master control panel for use in dynamic smoke-management systems.

M. Damper Motors: Two-position action.

N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230900 "Instrumentation and Control for HVAC."
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. 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.
5. Outdoor Motors and Motors in Outdoor-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.
6. 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.
7. Electrical Connection: 115 V, single phase, 60 Hz.

O. Accessories:

1. Test and reset switches, remote mounted.

2.8 FLANGE CONNECTORS

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

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

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

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

2.10 REMOTE DAMPER OPERATORS

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

1. Pottorff.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Galvanized spiral wire sheath.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed.

F. Wall-Box Cover-Plate Material: Steel.

2.11 DUCT-MOUNTED ACCESS DOORS

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

1. Ductmate Industries, Inc.
2. Greenheck Fan Corporation.
3. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Single wall or double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.12 DUCT ACCESS PANEL ASSEMBLIES

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

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 11-gage carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.13 FLEXIBLE CONNECTORS

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

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd..
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with 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.
3. Service Temperature: Minus 67 to plus 500 deg F.

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.14 FLEXIBLE DUCTS

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

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, polyethylene film supported by helically wound, galvanized-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 5500 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 23

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Utility set fans.
2. Centrifugal roof ventilators.
3. Ceiling-mounted ventilators.
4. In-line centrifugal fans.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

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

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.

1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.

1. Blade Materials: Steel.
2. Blade Type: Backward inclined.

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

1. Extend grease fitting to accessible location outside of unit.

F. Belt Drives:

1. Factory mounted, with final alignment and belt adjustment made after installation
2. Service Factor Based on Fan Motor Size: 1.5.
3. Motor Pulleys: Adjustable pitch for use with motors through **5** hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Inlet and Outlet: Flanged.
2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
4. Access Door: Gasketed door in scroll with latch-type handles.
5. Inlet Screens: Removable wire mesh.

6. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.
7. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.

2.2 CENTRIFUGAL ROOF VENTILATORS

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

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Downblast Units: Provide spun-aluminum discharge baffle to direct discharge air downward, with rain and snow drains.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: As required to maintain 12” above finish roof.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.

5. Metal Liner: Galvanized steel.

2.3 CEILING-MOUNTED VENTILATORS

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

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic or painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.4 IN-LINE CENTRIFUGAL FANS

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

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
6. Vibration Isolators:

    a. Type: Spring hangers.
    b. Static Deflection: 1 inch.

2.5 MOTORS

A. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.6 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 37 13

AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular core, square ceiling diffusers.
2. Perforated diffusers.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Modular Core, Square Ceiling Diffuser:

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

    a. Price Industries.
    b. Titus.
    c. Anemostat Products; a Mestek company.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Face Style: Modular Core.
6. Mounting: Surface.
7. Pattern: Adjustable.

B. Perforated Diffuser:

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

    a. Price Industries.
    b. Titus.
    c. Anemostat Products; a Mestek company.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Duct Inlet: Square.
6. Face Style: Flush.
7. Mounting: T-bar.
8. Pattern Controller: Adjustable with louvered pattern modules at inlet.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 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.

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

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

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 practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.
2. Gaskets: One set for each access door.

3. Fan Belts: One set for each air-handling unit fan.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 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:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Daikin.
2. LG
3. Carrier Corporation.
4. Mitsubishi Electric & Electronics USA, Inc.
5. Trane.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

    a. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    b. Enclosure Type: Totally enclosed, fan cooled.
    c. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    e. Mount unit-mounted disconnect switches on exterior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Filters: Permanent, cleanable.
7. Condensate Drain Pans:

    a. Fabricated with **one** percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 1 inch deep.

    b. Single-wall, galvanized-steel sheet.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 1.

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. 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.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant Charge: R-410A.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. 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.

D. Drain Hose: For condensate.

E. Additional Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor cooling load.
4. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

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.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 26

SECTION 23 81 29

VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes multi evaporator, direct expansion, air-cooled, variable capacity, split systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) for each air-handling unit.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 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:

a. For Compressor: 10 year(s) from date of Substantial Completion.
b. For Parts: 10 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Daikin
2. (or equal)

2.2 CONDENSING UNIT

A. General: The condensing unit is designed specifically for use with VRV IV series components.
   1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
      High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.
   2. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
   3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
   4. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
   5. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
   6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
   7. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
   8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
   9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
   10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
   11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
   12. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
   13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:
   1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:
   1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
   2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
   3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified.
   4. Nominal sound pressure levels shall be as shown below.
   5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
   6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
   7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps as shown below.

Operation Sound dB(A)	**Night Mode Sound Pressure Level dB(A)**
Step 1 max.	55
Step 2 max.	50
Step 3 max.	45

D. Condenser Coil:
   1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
   2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
   3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
   4. The fins are to be covered with an anti-corrosion Ulta Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10)
   5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
   6. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.

E. Compressor:
   1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as meas-

ured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insolation.
9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:
1. The power supply to the condensing unit shall be 460 volts, 3 phase, 60 hertz +/- 10%.
2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.

2.3 BS(4/6/8/10/12)Q_T BRANCH SELECTOR BOX FOR VRV IV HEAT RECOVERY SYSTEM

A. General: The BSQ36TVJ, BSQ60TVJ, BSQ96TVJ, BS4Q54TVJ, BS6Q54TVJ, BS8Q54TVJ, BS10Q54TVJ and BS12Q54TVJ branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.
   1. These selector boxes shall be factory assembled, wired, and piped.
   2. These BSQ_T / BS(4/6/8/10/12)Q54T branch controllers must be run tested at the factory.
   3. These selector boxes must be mounted indoors.
   4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:
   1. These units shall have a galvanized steel plate casing.
   2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
   3. The cabinet shall contain one subcooling heat exchanger per branch.
   4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
   5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed the values below.

Model Number	Sound Level dB(A) Operating	Sound Level dB(A) Max
BSQ36TVJ	42	32
BSQ60TVJ	43	32
BSQ96TVJ	44	34
BS4Q54TVJ	38	45
BS6Q54TVJ	39	47
BS8Q54TVJ	39	47
BS10Q54TVJ	40	48
BS12Q54TVJ	40	48

   If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

C. Dimensions:
   1. Each BSQ_T unit shall be no larger than 8-1/8” x 15-1/4” x 12-13/16”.
   2. Each BS4Q_T shall be no larger than 11-3/4” x 14-9/16” x 18-15/16”.
   3. Each BS(6/8)Q_T shall be no larger than 11-3/4” x 22-13/16” x 18-15/16”.
   4. Each BS(10/12)Q_T shall be no larger than 11-3/4” x 32-5/16” x 18-15/16”.

D. Refrigerant Valves:
   1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
   2. The refrigerant connections must be of the braze type.
   3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.

4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

E. Condensate Removal:
1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.4 VRV INDOOR UNITS

* FXMQ_M – CONCEALED CEILING DUCTED UNIT (Med. Static)

A. General: Daikin indoor unit FXMQ_M shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 72,000 Btu/h to 96,000 Btu/h. Model numbers are FXMQ72MVJU and FXMQ96MVJU to be connected to outdoor unit model RXYQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72 and BRC2A71. The indoor units sound pressure shall be 48 dB(A) at low speed measured 5 feet below the ducted unit.

B. Indoor Unit:
1. The Daikin indoor unit FXMQ_M shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a return air thermistor.
5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

6. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:
   1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
   2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:
   1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
   2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz, with a motor output of 0.51 HP.
   3. The airflow rate shall be available in high and low settings.
   4. The fan motor shall be thermally protected.
   5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

F. Coil:
   1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
   2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
   3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
   4. The refrigerant connections shall be flare connections and the condensate will be 1-5/16 inch outside diameter PVC.
   5. A thermistor will be located on the liquid and gas line.

G. Electrical:
   1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
   2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
   3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:
   1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
   2. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

FXMQ_PA - CONCEALED CEILING DUCTED UNIT (Med. Static)

A. General: Daikin indoor unit FXMQ_PA shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. Model numbers are FXMQ07PAVJU, FXMQ09PAVJU, FXMQ12PAVJU, FXMQ15PAVJU, FXMQ18PAVJU, FXMQ24PAVJU, FXMQ30PAVJU, FXMQ36PAVJU, FXMQ48PAVJU, and FXMQ54PAVJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ

heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72 and BRC2A71. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.

B. Indoor Unit:
   1. The Daikin indoor unit FXMQ_PA shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
   2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
   3. Both refrigerant lines shall be insulated from the outdoor unit.
   4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet and has a built in safety shutoff and alarm.
   5. The indoor units shall be equipped with a return air thermistor.
   6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
   7. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:
   1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
   2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:
   1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
   2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.
   3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
   4. The airflow rate shall be available in three settings.
   5. The fan motor shall be thermally protected.
   6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
   7. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)

FXMQ07PAVJU	0.40 – 0.12
FXMQ09PAVJU	0.40 – 0.12
FXMQ12PAVJU	0.40 – 0.12
FXMQ15PAVJU	0.80 – 0.20
FXMQ18PAVJU	0.80 – 0.20
FXMQ24PAVJU	0.80 – 0.20
FXMQ30PAVJU	0.80 – 0.20
FXMQ36PAVJU	0.80 – 0.20
FXMQ48PAVJU	0.80 – 0.20
FXMQ54PAVJU	0.56 – 0.20

F. Coil:
   1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
   2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
   3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
   4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4” outside diameter PVC.
   5. A condensate pan shall be located under the coil.
   6. A condensate pump with an 18-3/8” lift shall be located below the coil in the condensate pan with a built in safety alarm.
   7. A thermistor will be located on the liquid and gas line.

G. Electrical:
   1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
   2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
   3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:
   1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
   2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
   3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:
   1. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply **and return** ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

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.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 29

SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL

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 this Section.
2. Electrical General Provisions and Requirements for electrical work.
3. Division-1; General Requirements; General Conditions.

B. Organization of the Specifications into Divisions, Sections and Articles, and arrangement of Drawings shall not control the Contractor in dividing the Contract Work among Sub-Contractors or in establishing the extent of work to be performed by any trade.

1.02 GENERAL SUMMARY OF ELECTRICAL WORK

A. The Specifications and Drawings are intended to cover the complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. Refer to the Drawings and Shop Drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

C. Before submitting a bid, the Contractor shall become familiar with all features of the Building Drawings and Site Drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.

D. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the District's Representative before submitting bid and before commencing work.

E. Provide work and material in conformance with the Manufacturer's published recommendations for respective equipment and systems.

1.03 LOCATIONS OF EQUIPMENT

A. The Drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

B. Where outlets are placed on a wall, locate symmetrically with respect to each other, furniture, cabinets, and other features or finishes on the wall.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the Contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.

D. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light outlets or fixtures until mechanical piping and ductwork is installed; then install lights in a location to provide best lighting.

E. Coordinate and cooperate in every way with other trades in order to avoid interference and ensure a satisfactory job.

F. The location of the existing utilities, building, equipment and conduit shown on the Drawings is approximate. Verify exact locations and routing of existing systems by potholing all trench routes prior to digging the trench. Pothole at least 100 feet ahead of the actual trenching to allow space to alter the new conduit routing to accommodate existing conditions.

G. Underground Detection Services Existing Utility Structures

1. Detection/location services shall be provided utilizing the latest detection equipment available. Services shall be performed by a company regularly engaged in the business of existing Underground Utility Structure Detection for the past 5-years.

2. Prior to excavation and prior to directional boring the following work shall be performed:

   a. Contractor to mark excavating and trenching/directional boring locations and indicate width and depth.

   b. Locate, by way of vertical and horizontal control dimensions, existing subgrade petroleum product pipes, process piping, conduits, sewer, water, gas, storm drain, electrical, telephone, and irrigation lines in the affected areas of Contract construction work.

   c. Arrange and meet with the District's Representative to review existing underground conditions.

   d. The proposed route of each excavation shall be continuously surveyed along the entire excavation path using Ground-Penetrating Radar (GPR) operating from the surface grade. The GPR shall detect and map existing underground metal and non-metal, both private and public utility lines, pipes, conduits, conductors, etc. The GPR shall identify the horizontal and vertical location of existing underground conditions located at a depth of up to 3-meters below finish grade and located with a vertical and horizontal accuracy within ±12-inches of actual condition. The Contractor shall add this information to the existing conditions site plan.

3. Exercise extreme caution in directional boring, excavating and trenching on this site to avoid existing underground utilities and structures, and to prevent hazard to personnel and/or damage to existing underground utilities or structures. The Contract Documents, Drawings and Specifications do not include necessary components for construction safety, which is the responsibility of the Contractor.

4. Repair/replace, without additional cost to the Contract, and to the satisfaction of the District any existing work damaged that was identified in the Record Drawings provided; Identified by the District's Representative; Identified by the Underground Detection Services performed; or any existing work damaged as a result of failure to comply with all the Referenced Requirements.
5. The Contractor shall contact Common Ground Alliance (CGA) telephone #811 "Know What's Below-Call Before You Dig" and Underground Service Alert (USA), not less than 72-hours prior to excavation. Contractor shall not excavate until verification has been received from CGA and USA that existing underground utilities serving the site have been located, identified, and marked.

H. The locations of existing underground utilities, where shown on Drawings, are shown diagrammatically and have not been independently verified by the District, the District's Representative, the Architect/Engineer. The District, the District's Representative, and the District's Architect/Engineer are not responsible for the location of underground utilities or structures, whether or not shown or detailed and installed under this or any other Contracts. The Contractor shall identify each existing utility line prior to excavation and mark the locations on the ground of each existing utility line.

1.04 AIR CONDITIONING, HEATING, PLUMBING EQUIPMENT WIRING

Provide electrical work, materials, and control components required for proper operation of the air conditioning, heating and plumbing systems as indicated on the Electrical, Mechanical, and Plumbing Contract Documents and specified herein.

1.05 PERMITS

Take out and pay for all Required Permits, Inspections and Examinations without additional cost to the District.

1.06 QUALITY ASSURANCE

A. Work and Materials shall be in full accordance with the latest Rules and Regulations. The publications shall be included in the Contract Documents Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:
   1. California Code of Regulations Title 24.
   2. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
   3. California Building Code – CBC.
   4. California Fire Code – CFC
   5. The National Electrical Code – NEC/NFPA 70.
   6. International Building Code – IBC.
   7. National Fire Protection Agency – NFPA.
   8. National Fire Alarm Code – NFAC/NFPA 72.

9. Underwriter's Laboratory – UL.
10. Other applicable State and Local Government Agencies Laws and Regulations.
11. Electrical Installation Standards National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):
    a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Contracting
    b. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, etc.)
    c. NECA/NEIS-104: Recommended Practice for Installing Aluminum Building Wire and Cable
    d. NECA/NEIS-105: Recommended Practice Installing Metal Cable Trays
    e. NECA/NEIS-111: Recommended Practice Installing Nonmetallic Raceways
    f. NECA/NEIS-230: Recommended Practice for Installing Motors
    g. NECA/FOA-301: Standards for Installing and Testing Fiber Optic Cables
    h. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
    i. NECA/NEIS–331: Standards for Installing Building and Service Entrance Grounding
    j. NECA/NEIS-400: Recommended Practice for Installing and Maintaining Switchboards
    k. NECA/NEIS-402: Recommended Practice for Installing and Maintaining Motor Control Centers
    l. NEIS/NECA and EGSA-404: Recommended Practice for installing Generator Sets
    m. NECA/NEIS-405: Recommended Practices for installing and Commissioning Interconnected Generation Systems
    n. NECA/NEIS-407: Recommended Practice for Installing Panelboards
    o. NECA/NEIS-408: Recommended Practices for Installing Busway
    p. NECA/NEIS-409: Recommended Practice for Installing and Maintaining Dry-Type Transformers
    q. NEIS/NECA and IESNA-500: Recommended Practice for installing indoor Commercial Lighting Systems
    r. NEIS/NECA and IESNA-501: Recommended Practice for Installing Exterior Lighting Systems
    s. NEIS and IESNA-502: Recommended Practice for Installing Industrial Lighting Systems
    t. NECA/BICSI-568: Standards for Installing Commercial Building Telecommunications System
    u. NECA/NEIS-600: Recommended Practice Installing Medium-Voltage Cable

B. All Material and Equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized Testing Laboratories, where such listings are available. Comply with all Installation Requirements and restrictions pertaining to such listings.

C. Work and Material shown on the Drawings and in the Specifications are new and included in the Contract unless specifically indicated as existing or N.I.C. (not in Contract).

D. Keep a copy of all applicable Codes and Standards available at the job site at all times for reference while performing work under this Contract. Nothing in Plans or Specifications shall be construed to permit work not conforming to the most stringent of Building Codes.

E. Where a conflict or variation occurs between applicable Codes, Standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the Requirement of the Contract Documents.

1.07 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Review of Contractor's submittals is for General Conformance with the design concept of the Project and General Compliance with the information given in the Contract Documents. Any action shown is subject to the Requirements of the Plans and Specifications. Contractor is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.

2. The Contractor shall review each submittal in detail for compliance with the Requirements of the Contract Documents prior to submittal. The Contractor shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The Contractor shall clearly and specifically identify each individual proposed substitution, substitution of equal or proposed deviation from the Requirements of the Contract Documents with a statement "THIS ITEM IS A SUBSTITUTION".

   The burden of research, preparation of calculations and the furnishing of adequate and complete Shop Drawings information to demonstrate the suitability of Contractor’s proposed substitutions and suitability of proposed deviations from the Contract Documents is the responsibility of the Contractor.

3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the Contractor to comply with the Submittal Requirements shall render void any acceptance or any approval of the proposed variation. The Contractor shall then be required to provide the equipment or method without variation from the Contract Documents and without additional cost to the Contract.

4. The Contractor at no additional cost or delays to the Contract shall remove any work, material and correct any deficiencies resulting from deviations from the Requirements of the Contract Documents not approved in advance by the District prior to commencement of work.

5. Shop Drawings submitted by the Contractor, which are not specifically required for submittal by the Contract Documents, or Contractor Shop Drawings previously reviewed and resubmitted without a written resubmittal request to the Contractor, will not be reviewed, considered, or commented on. The respective Shop Drawing submittal / resubmittal will not be returned to the Contractor and will be destroyed without comment or response to the Contractor. The respective submittal shall be considered null and void as being not in compliance with the Requirements of the Contract Documents.

6. Refer to Division-1 for Additional Requirements.

B. Material Lists and Shop Drawings

1. Submit material list and Equipment Manufacturers for review within 35 days of award of Contract. Give name of Manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing of more than one Manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type designation, is not acceptable. Shop Drawings shall not be submitted before reviewing completion of Manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.
2. After completion of review of the Material and Equipment Manufacturers list, submit Shop Drawings for review. Shop Drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The Contractor shall verify dimensions of equipment and be satisfied as to fit and that they comply with all code Requirements relating to clear working space about electrical equipment prior to submitting Shop Drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the Contract Documents, must be specifically noted as such. The Requirements of the Contract Documents shall prevail regardless of the acceptance of the submittal.
3. Shop Drawings shall include catalog data sheets, instruction manuals, Dimensioned Plans, elevations, details, wiring diagrams, and descriptive literature of component parts where applicable. Structural calculations and mounting details, signed by a Structural Engineer registered by the State of California, shall be submitted for all equipment weighing over 400-pounds, and shall be in compliance with Title 21 of the California Code of Regulations.
4. Each Shop Drawing item shall be identified with the Specification Section and paragraph numbers, lighting fixture types and Drawing sheet numbers; the specific Shop Drawing is intended to represent. Shop Drawings 11-inches by 17-inches or smaller in size shall be bound in three ring binders. Divider tabs shall be provided in the three ring binders identifying and separating each separate Shop Drawing submittal item. Shop Drawings larger than 11-inches by 17-inches, Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
5. The time required to review and comment on the Contractor's submittals will not be less than 14 calendar days, after receipt of the submittals at the office of FBA Engineering. The review of Contractor submittals and return to Contractor of submittals with review comments will occur in a timely manner conditioned upon the Contractor complying with all the following:
    a. The submittals contain complete and accurate information, complying with the Requirements of the Contract Documents.
    b. Contractor's submittals are each marked with Contractor's approval "stamp", and with Contractor signatures.
    c. The submittals are received in accordance with a written, shop drawing submittal schedule for each submittal. The Contractor distributes the schedule not less than 35-calendar days in advance of the Shop Drawing Submittals, and the schedule identifies the calendar dates, the Contractor will deliver the various submittals for review.

6. Shop Drawings shall include the Manufacturers projected days for shipment from the factory of completed equipment, after the Contractor releases the equipment for production. It shall be the responsibility of the Contractor to insure that all material and equipment is ordered in time to provide an orderly progression of the work. The Contractor shall notify the District's Representative of any changes in delivery, which would affect the Project completion date.
7. Submittal Identification
    a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable Specification/Drawing references *(i.e., Submittal dated: 05/12/98 Submittal #4 Contents: Branch Circuit Panelboards Sheet #E5.1 and Transformers Specification Section 26 05 01 Paragraph 2.11, etc.).*
    b. Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled with submittal contents identification and applicable Specifications/Drawing references *(i.e., Original Submittal Date: 5/12/98 Resubmittal Date: 10/09/98 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section – 26 05 01 Paragraph 2.11, etc.).*
    c. Contractor shall provide a written response narrative with each resubmittal. Describe each response-action, resubmittal addition, change and deletion. Correspond to each response to A/E specific review comment.

C. The Contractor shall be responsible for incidental, direct and indirect costs resulting from the Contractor's substitution of; or changes to; the specified Contract Materials and Work.

D. The Contractor shall pay, upon request by the District's Representative, a fee for the District's Representative time involved in the review of substitution submittals and design changes resulting from the Contractor's requested substitutions. The fee shall be not less than $125.00 per hour but, in no case, less than stated in Division-1, whichever is greater.

E. Maintenance and Operating Manuals
    1. The Contractor shall furnish three copies of type-written Maintenance and Operating Manuals for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the District.
    2. Instruct the District's Personnel in correct operation of all equipment at completion of Project. Provide the quantity and duration of instruction class as specified; but in no case less than two 4-hour durations separate instruction classes for each individual equipment group furnished as part of the Contract. Instruction classes shall be presented by Manufacturer's Authorized Field Service Engineer at the Project Site. Instruction class size shall be at the District's discretion, not less than one or more than fifteen students shall attend each instruction session. Submit fifteen written outline copies of the proposed instruction class curriculum, 14-days prior to the class-scheduled dates.
    3. Maintenance and operating manuals shall be bound in three ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the District's Representative, with an itemized receipt.

F. Portable or Detachable Parts: The Contractor shall retain in his possession and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of Contract Work. These parts shall then be delivered to the District's Representative with an itemized receipt.

G. Record Drawings (Additional Requirements)

1. Provide and maintain in good order a complete set of Electrical Contract "Record" prints. Changes to the Contract to be clearly recorded on this set of prints. At the end of the Project, transfer all changes to one set of transparencies to be delivered unfolded to the District's Representative.
2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. If any necessary dimensions are omitted from the Record Drawings, the Contractor shall, at the Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
3. The Contractor shall keep the "Record" prints up to date and current with all work performed.
4. Refer to Division-1 for Additional Requirements.

1.08 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.09 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the District and replace all damaged or defective work, materials, and equipment before requesting final acceptance.

1.10 EXCAVATION, CUTTING, BACKFILL AND PATCHING ADDITIONAL REQUIREMENTS

A. General

1. Perform excavation, cutting, backfill, core drilling, directional boring, and patching of the construction work required for the proper installation of the electrical work.
2. Patching shall be of the same material, thickness, workmanship, and finish as existing and accurately match-surrounding work to the satisfaction of the District's Representative.
3. Prior to penetrating, coring, drilling or cutting existing building elements, concrete and/or masonry, provide imaging equipment examinations of each specific location. The imaging process shall identify existing internal embedded components and locations, including structural elements/anchors, conduit, and piping that are present. Do not penetrate or damage the existing internal embedded elements.

Imaging shall employ one of the following, with GPR methodology preferred:

a. Non-invasive imaging employing high frequency, Ground Penetrating Radar (GPR), single side echo reflection technology.

b. Non-invasive imaging employing x-ray radiography, through-and-through imaging technology.

B. Excavation Temporary Cover

1. Excavations for Contract Work occurring in streets, vehicular drive areas, parking lots, sidewalks; any paved surface; or any area accessible to the public; provide temporary steel plating and shoring support for the plates, to completely cover the excavations under one or more of the following conditions:

a. Excavation shall not remain "open" for more than 4-calendar days; provide temporary plating.

b. Excavation shall not be "open" over weekends (Saturday, Sunday) or Holidays; provide temporary plating.

2. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than required to support AASHO-H20 traffic loading.

3. Provide a minimum of two 100% open lane(s) (12-foot lane width) for vehicular traffic at all times during construction, for vehicle access to all areas.

1.11 IDENTIFICATION

A. Equipment Nameplates

1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.

2. Provide nameplate label on electrical service entrance equipment describing available short circuit information calculated by the Contractor, including:

a. Calculation date, month-day-year.

b. Calculate maximum available short circuit fault current.

c. Description of parameters and changes affecting the Requirements for recalculation of the fault current information.

3. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with “Electric-Arc-Flash” warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct personnel to wear the correct Protective Equipment/clothing (PPE) when working “Live” or operating “Live” electrical equipment and circuits.

4. Nameplates shall be engraved laminated phenolic. Shop Drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.

5. Provide black-on-white laminated plastic nameplates engraved in minimum ¼-inch high letters to correspond with the designations on the Drawings. Provide other or additional information on nameplates where indicated.

B. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions (minimum character size not less than 0.188 inch. Engraving shall indicate circuits and equipment controlled or connected):

1. More than two devices under a common coverplate.
2. Lock switches.
3. Pilot switches.
4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
5. Manual motor starting switches.
6. Where so indicated on the Drawings.
7. As required on all control circuit switches, such as heater controls, motor controls, etc.
8. Receptacles other than standard 15-amp 120-volt duplex receptacles; shall indicate circuit voltage, ampere, phase and source circuit number.
9. Where outlets or switches are connected to emergency power circuit; provide panelboard and circuit number engraved on plate.
10. Low voltage and signal system outlets.

C. For equipment and access doors or gates to equipment containing or operating on circuits of more than 100 volts AC or DC nominal. Provide red-on-white laminated warning signs engraved in ½-inch high letters to read: "DANGER - 480 *(or applicable voltage)* VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".

D. Wire and Cable Identification

1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.
    a. Individual wire and cable larger than #6AWG or 0.25-inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alphanumeric characters, character height 0.25 inch. Attach identification tags with plastic “tie” wraps, minimum of two for each tag. As manufactured by Almetek Industries- “EZTAG” series; or TECH Products - “EVERLAST” series.
    b. Individual wire and cable #6AWG and smaller or smaller than 0.25-inch diameter, shall be provided with water and oil resistant, flexible, self-laminating pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification. As manufactured by Brady Identification; or 3M; or Panduit.

c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.

E. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuits, area, and connected load.

F. Junction and pull boxes shall have covers stenciled with box number when shown on the Drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.12 TESTING

A. The Contractor shall obtain an independent Testing Laboratory, provide all instrumentation and perform tests on the electrical system and equipment as hereinafter described and further directed by the District's Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the District's Representative for review.

1. All equipment and personnel required for set-up and testing shall be provided by the Contractor.

B. Test for Phase to Ground and Neutral Condition:

1. Open main service disconnects.
2. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
3. Close all submain disconnects.
4. Close all branch feeder circuit breakers.
5. Turn all switches to "on" position, unplug all portable equipment from outlet receptacles.
6. Measure the resistance of each phase to ground and phase to neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
7. Record all readings after 1-minute duration and document into a complete report.
8. Isolating Grounds: In the event that low resistance ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore resistance values to an acceptable value.

C. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.

1. Perform "fall-of-potential" three-point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.

2. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

D. The Testing, Calibrating and Setting of all ground and ground fault equipment, circuit breakers, circuit device protection relays, and meters adjustable settings shall be by an independent Testing Laboratory. Set as recommended by the respective Manufacturer and Coordination Study to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the District's Representative.

E. Ampere and Voltage Measurements

1. Measure and record ampere and line voltage measurements under full load on all panel feeders, switchboard, and switchgear feeders, motor control centers and motor circuits provided in the Contract. Record measurements at the equipment tested and submit to the District's Representative for review.

2. Ampere voltage readings shall be:
   a. Phase A-B, A-C and B-C.
   b. Phase A-Neutral, B-Neutral and C-Neutral.

3. The ampere and voltage readings shall be not less than 20-minutes duration for each test. Record and submit the measured minimum, maximum and 20-minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.

4. Test equipment shall be accurate within plus or minus 1%.

5. Branch circuit devices 40-amp or less and motor loads ten horsepower or smaller are excluded from Ampere and Voltage Testing Requirement.

6. If, in the opinion of the District's Representative, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service. Retest feeder line voltages, and submit to District's Representative for review, after the Utility Company has completed corrective actions. Reset "voltage taps" on transformers provided or modified as part of the Contract Work, to adjust line voltages to within acceptable values, as directed by the District's Representative.

F. The Contractor shall complete the following work before any electrical equipment is energized.

1. All equipment shall be permanently anchored.

2. All bus connections and conductor/wire connections shall be tightened per Manufacturer's instructions and witnessed by the District's Representative.

3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.

4. Feeders shall be connected and identified.

5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasives over spray removed and equipment vacuumed clean. The District's Representative shall observe all interiors before covers are installed.

6. All wall, ceiling, and floor work and painting shall be completed within areas containing electrical equipment prior to installation of equipment. The equipment indoor rooms and spaces shall be weather-tight and weather protected from environmental incursions.
7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
8. Electrical spaces and rooms shall not be used as storage rooms after power is energized.
9. Outdoor electrical equipment enclosures and housings shall be weather protected.
10. The electrical system time current coordination and Arc-Fault study shall be complete for circuit breakers, ground relays sets, and circuit relay sets, fuses; set-up, tested and calibrated accordingly.

1.13 COMMISSIONING - CX

A. General

1. The Commissioning shall verify the electrical systems for the term of the Contract, by observation; and by calibration; and by testing. The Commissioning shall ensure the electrical systems perform interactively and correctly, according to the Contract and Operational Requirements.
2. Commissioning shall provide startup, testing and documented confirmation of the Contract Constructed Systems, materials and work, functions in compliance within the criteria set forth in the Contract Documents to the satisfaction of the District's needs. The Commissioning Scope shall encompass each system identified as requiring "Commissioning" by the Contract Documents, including but not limited to:
   a. Electrical circuits' protection, short circuit, overcurrent, and ground fault devices.
   b. Electrical circuits monitoring and metering.
   c. Light fixtures, lamps and ballasts.
   d. Lighting control devices, equipment and lighting control systems.
   e. Standby and emergency electric power supply equipment and systems.
   f. Fire alarm, equipment, devices and fire alarm systems.
   g. Additional systems described in the Contract Documents.
3. Commissioning process shall review all the Shop Drawing submittals, including:
   a. Controls, Operation and Maintenance Requirements.
   b. Facility performance testing compliance.
   c. Project Contract Requirements compliance.
   d. Compliance with basis for design and operational descriptions provided in the Contract.
4. Commissioning shall be the process of ensuring all the systems described in the Contract Documents comply with the Contract Document design; all systems are installed properly; all systems are functional, tested and capable of being operated and maintained to perform within the Contract Requirements and design intent.
5. Functional setup, recalibration, correcting deficiencies, retesting and the associated costs, for system(s) that fail Commissioning, shall be the responsibility of the Contractor. The Contractor shall include all Commissioning costs in the Contract Scope of Work.

6. Complete all Commissioning Functions prior to the occupancy of the facility by the District, unless directed otherwise by the District's Representative.
7. Submit six copies of Commissioning Documentation to District's Representative.
8. Commissioning unless specifically indicated otherwise, shall be performed by Factory-Trained Technician(s) Authorized and Certified by the Manufacturers of the respective equipment/systems. Where specifically indicated, commissioning shall be performed by Independent Test Lab.

B. Commissioning Procedures

1. Prepare a Commissioning matrix identifying components and systems included in the Commissioning Scope; the status; actions completed and actions to be completed.
2. Verify Contractor compliance with Contract Document Requirements Manufacturer's recommendations and approved Shop Drawings.
3. Perform startup, functional tests, reports, and document results.
4. Evaluate and document the setup parameters, software, operating condition and performance of each system at the time of functional test completion. Document and record each performance parameter and condition, in the Commissioning Report.
5. Schedule testing and prepare descriptions of testing.
6. Describe measures performed to correct deficiencies.
7. Verify that instructions to District's Representatives, Operations and maintenance manuals comply with Contract Documents.
8. Prepare warranty matrix identifying the start dates, expiration dates, routine preventative maintenance dates and the District's responsibility for performing preventative maintenance and keeping logs for each maintenance function and warranty claims.
9. Confirm completion of all punch list items that have been acceptably accomplished and a list of what has not been acceptably completed.
10. Describe uncorrected deficiencies accepted by the District.

C. Commissioning Phasing

The Commissioning Phases of work shall include the following activities:

1. SDQ – Shop Drawing Qualification shall verify complete and correct Shop Drawings have been submitted.
2. IQ – The Installation Qualification of Contract Work shall verify systems are correctly and properly installed.
3. OQ – Verify systems interfaces and software is correctly and properly operational.
4. ITM – Verify the Contract Inspection, Testing and Procedures for Maintenance are complete.
5. PQ – Performance Qualification complete the functional performance testing to validate each building system.

1.14 POWER OUTAGES

A. All electrical services in all occupied facilities of the Contract Work are to remain operational during the entire Contract period. Any interruption of the electrical services for the performance of this work shall be at the convenience of the District and performed only after consultation with the District's Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the District.

B. Contract Work involving outages or disruption of normal function in electrical power systems, telephone/communication systems, fire alarms, shall be performed during the following time periods. The Contract Work shall be phased to limit outages in the respective systems to the stated periods:

   1. 11:30 p.m. Friday to 11:30 p.m. Sunday of the same weekend. Work shall occur on multiple weekend periods if a single weekend is not sufficient time to complete the work.
   2. The Contract Work involving outages shall be phased in multiple work time units, to comply with the permitted outage limitations.

C. Work involving system outages to the building fire alarm system shall be performed only after consultation with the District and shall be only at such a time and of such duration as approved in writing. Contractor shall provide continuous "Fire-Watch" during fire alarm system outages and comply with AHJ "Fire-Watch" Requirements.

D. Provide overtime work; double shift work; night time work; Saturday, Sunday, and holiday work to meet outages schedule.

E. Provide temporary electrical power to meet the Requirements of this Article.

F. Any added costs to Contractor due to necessity of complying with this Article shall be included in the Contract Scope of Work.

G. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.

H. The Contractor shall request in writing to the District's Representative a minimum of 3-weeks in advance, for any proposed electrical outage.

1.15 TEMPORARY ELECTRICAL POWER

A. Provide temporary electrical power if work requiring power outages cannot be completed in time permitted and approved by the District's Representative.

B. Temporary electrical power shall be a standby diesel engine generator. Voltage, frequency, regulation, etc. shall be equal to that of normal utility source. Exhaust system shall have a critical silencing muffler. Generator voltage shall match the existing secondary voltage required at the site. The Contractor shall furnish all necessary cables, switches, etc., to make all required connections to existing panels, feeders, etc. Generator shall be sized to adequately carry the demand load. If record of demand load is not available, size generator to match corresponding transformer, maximum capacity circuit as directed by the District's Representative.

C. After completion of required usage of the temporary generators, prior to completion of the Project, the Contractor shall remove the generators. All temporary cables, switches, etc. shall be removed and all permanent equipment left in satisfactory condition.

D. Each generator shall be housed in security type sound attenuated housing to prevent access by unauthorized personnel. Temporary power cables, connections, etc. shall be protected from unauthorized Personnel.

E. The Contractor shall be responsible for complete operation of the generator including personnel, fuel supplies, proper safety precautions, etc. Generator shall not be left unattended while in operation.

F. The Contractor shall provide temporary construction lighting and power as required in areas where work is being performed. Temporary power arrangements, outages, installation, work schedules, etc., shall be submitted in writing 3-weeks prior to requested outage date, and approved by the District's Representative prior to start of work.

1.16 ASBESTOS, POLYCHLORINATED BIPHENYL (PCB) OR HAZARDOUS WASTE:

A. It is understood and agreed that this Contract does not contemplate the handling of asbestos, PCB or any hazardous waste material. If asbestos, PCB or any hazardous waste material is encountered, notify the District's Representative immediately. Do not disturb, handle or attempt to remove.

B. Lighting Fixture Demolition Hazardous Materials

1. The removal of existing lighting fixtures will generate hazardous material waste disposal Contract Documents.
    a. The existing lighting fixture ballast contains PCB material.
    b. The existing lighting fixture lamps contain mercury.
    c. The existing lighting fixture internal wire insulation may contain asbestos.
2. Remove, handle, store, contain, dispose of and document the hazardous materials resulting from existing lighting fixtures work, as part of the Contract Requirements.

1.17 TIME/CURRENT COORDINATION, SHORT CIRCUIT, ARC-FLASH AND SERIES RATED EQUIPMENT

A. Series Rated Equipment.

1. Circuit protective Devices identified as "Series Rated" or "Current Limiting" (i.e., CLCB - Current Limiting Circuit Breaker; CLF - Current Limiting Fuse, etc.) shall be Series Rated and Tested (UL 489 and CSA5) by the Manufacturer with all equipment and circuit protective devices installed downstream of the identified series rated or current limiting device.
2. Provide nameplates on all equipment located downstream, including the CLCB and CLF devices, to comply with CEC paragraphs 110-22 and 240-83 "CAUTION SERIES RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS".

B. Short Circuit, Coordination and Arc-Flash

1. Perform Engineering Analysis and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide the selective coordination within the limits of the specified equipment. Shall

comply with the latest application Standards of IEEE and ANSI. Provide electrical system short circuit worst case bolted-fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.

2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment. Shall comply with, but not limited to:
   a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
   b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
   c. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.
   d. CEC
4. Provide permanent warning labels on each equipment location. The labels shall describe Arc-Flash, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also described actions to be taken if any circuit changes or equipment modifications occur.
5. Shall be submitted with the Shop Drawing submittals for the respective equipment.

1.18 INDEPENDENT TESTING LABORATORY

A. Testing Laboratories Definition

1. The Testing Laboratory shall meet Federal OSHA Criteria for accreditation of Nationally Recognized Testing Laboratories (NRTL) Title 29 Part 1907 and 29 CFR-1910.
2. Membership in the National Electrical Testing Association (NETA) shall also constitute acceptance of meeting said criteria for testing electrical systems.

1.19 SPARE FUSES

Provide three spare fuses for each size and type at each location to match the installed fuses where the fuses are provided as part of the Contract. Provide spare fuse holders on inside door of each respective fuse compartment. Provide engraved nameplate on front of fuse access door indicating fuse type/catalog number ampere rating and Manufacturer of fuse.

1.20 EQUIPMENT SEISMIC AND WIND LOAD REQUIREMENTS (ADDITIONAL REQUIREMENTS)

A. Refer to Structural, Architectural, and Soils Report Contract Documents for Additional Requirements.

B. General

1. Equipment supports and anchorages provided as part of the Contract shall be designed, constructed and installed in accordance with the Earthquake Regulations of the California Building Code (CBC), International Building Code (IBC).

2. Provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, signed and "Stamped" with PE Registration in good standing, by a Civil or Structural Engineer Licensed as a Professional Engineer (PE) in the State of California.
3. Mounting recommendations shall be provided by the Manufacturer based upon approved shake-table tests used to verify the seismic design of that type of equipment.
4. The Equipment Manufacturer shall document the details necessary for proper wind-load and seismic mounting, anchorage, and bracing of the equipment for floor, ceiling, and wall/back installation location.
5. Seismic Performance shall be based on actual installation location of the respective equipment in the building and height above or below grade.
6. The seismic Requirements are typical for each equipment item exceeding 19-pounds, including but not limited to the following:
    a. Switchgear, switchboards, and motor control equipment
    b. Transformers
    c. Equipment racks and terminal cabinets
    d. Panels
    e. Conduits with floor, ceiling or wall attachment support and conduits with suspension attachments.
    f. Busway, wire way and cable tray
    g. Uninterruptable power supplies (UPS)
    h. Inverters
    i. Generators and related equipment
    j. Lighting equipment
    k. Fire alarm equipment

C. Certification

1. Electrical Equipment Manufacturers and Contractor shall provide Special Seismic Certification (SCC) for each specific equipment configuration with shake-table verification, all furnished as part of the Contract Documents Requirements. The SCC shall include the specific installation location characteristics of the respective equipment including as follows:
    a. Ground or floor attachment
    b. Wall attachment
    c. Ceiling attachment
    d. Roof attachment
2. Wind Loading

    Electrical equipment and anchorages shall withstand the wind-load imposed at the install location. Wind Loading Withstand Requirements shall apply to all electrical equipment installed in outdoor locations and to all electrical equipment exposed to the weather. The equipment shall be Tested and Certified by the Manufacturer and Contractor.

The Wind-Load Withstand Qualification of the equipment and anchorages shall be verified by the following methods:

a. Aerodynamic wind tunnel test method.
b. Analytical calculation method, for oversized equipment too large for wind tunnel test method.

3. The Wind-Load Withstand Rating, and the SCC shall comply with the Requirements of the Authority Having Jurisdiction (AHJ), and include the latest revisions, but not limited to the following:
   a. American Society of Civil Engineers; ASCE-7
   b. CBC/IBC; including but not limited to Sections 1702, 1708, 1709, 1708A and 1709A.
   c. California Office of Statewide Health Planning and Development OSHPD; OPA-Preapproval of Anchorage; Code Application Notice CAN 2-1708A.5 and OSP-Special Seismic Certification Approval
   d. US Department of Homeland Security; FEMA- (installing seismic restraints for electrical equipment)

D. Wall Mounted Electrical Equipment
   1. Surface Mounted Equipment
      a. Provide multiple horizontal sections of metal "C" Channels for support and attaching wall mounted equipment to walls. Channels shall provide "turned lips" at longitudinal edges to hold "lock-in" fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.
      b. The "C" Channels shall be positioned horizontally within 3-inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate "C" Channels at not less than 36-inches on center between the "top" and "bottom" "C" Channel positions, located behind each equipment vertical Section.
      c. The "C" Channels shall be of sufficient length to provide connection to not less than two vertical structural wall framing elements separated by not less than 16-inches; but in no case shall the "C" Channel length be less than the width of the respective Equipment Section.
      d. Attach the "C" Channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.
      e. Attach the "C" Channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled "afterset" expansion anchors for existing masonry and concrete construction.
      f. Attach the equipment to the "C" Channels with threaded and bolted fasteners to "pre-locate" and lock into the channel "turned lips" and channel walls.
   2. Flush mount equipment
      a. Provide anchor attachment of equipment into adjacent wall structural elements.

E. Housekeeping Pad

1. Provide cast-in-place, steel re-enforced concrete raised “housekeeping” pads under all floor standing electrical equipment (except data network equipment racks).
2. Pad sizes
   a. The raised housekeeping pad height shall extend 4-inches above the surrounding finished-floor elevation for interior building locations.
   b. The pad shall extend 8-inches below finish grade plus 4-inches above finish grade for outdoor equipment location on grade.
   c. The pads shall extend 7-inches past the “footprint” edge of the respective floor standing equipment.
3. Anchor equipment to pads. Anchor pads to the building structural floor. Equipment pad, equipment re-enforcing and equipment anchoring shall comply with Seismic Earthquake Requirements and Wind Load Requirements.
4. Unless shown otherwise on Drawings. The equipment housekeeping pad steel re-enforcing shall consist of two layers of Number 4-size steel-rebar laid horizontally and uniformly spaced 6-inches on center. Position rebars in two directions (90-degrees opposed) and centered inside the concrete housekeeping pad. Horizontal rebar shall extend to within 3-inches of the edge of the concrete pad in all directions. Metal wire “tie-wrap” shall be provided at each rebar crossing.
5. Equipment anchor attachments shall extend through the housekeeping pad and into the structural concrete below the pad a minimum of not less than 2-inches.

1.21 ELECTRICAL WORK CLOSEOUT

A. Prepare the following items and submit to the District’s Representative before final acceptance.

1. Two copies of all test results as required under this Section.
2. Two copies of Local and/or State Code Enforcing Authority’s Final Inspection Certificates.
3. Copies of Record Drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
4. Two copies of all receipts transferring portable or detachable parts to the District’s Representative when requested.
5. Notify the District’s Representative in writing when installation is complete and that a Final Inspection of this work can be performed. In the event any defect or deficiencies are found during this Final Inspection they shall be corrected to the satisfaction of the District’s Representative before final acceptance can be issued.
6. List of spare fuses and locations identified by equipment name and building designation.
7. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, bus-ways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed/connected and prior to energizing the equipment. The torque values shall comply with Manufacturer's recommendations.

B. Electrical Power Single Line Diagrams – SLD

1. Provide single line diagrams showing the Contract Document Work complete electrical power system (normal and emergency). SLD shall show inter-connection circuits, electrical equipment, panels, and circuit protection devices, nominal 50% (½-size) approximately 18-inches by 24-inches. Show installed voltages and electrical capacity sizes.
2. SLD shall be mounted in metal (picture frame) rigid enclosure frame with rigid-backing (backer-board) and clear/transparent front, for hanging on wall. Provide clear transparent cover over SLD inside the frame.
3. Provide a wall-hung (±48-inches) SLD in each "main" and "sub" electrical equipment room. If wall space is limited, alternatively securely attach SLD frame to room door facing into the respective electrical room.

END OF SECTION 26 05 00

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SECTION 26 05 01

BASIC ELECTRICAL MATERIALS AND METHODS

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 this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit Product Data Sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, and disconnects fuses.

B. Submit Detailed Shop Drawings including Dimensioned Plans, Elevations, Details, Schematic and Point-to-Point Wiring Diagrams and descriptive literature for all component parts for transformers, relays, time clocks, and photocells.

C. Submit Transformer Test Reports.

D. Submit Material List for Outlet Boxes.

PART 2 PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

A. General:

1. Flush or concealed outlet boxes and junction boxes.
   a. Non-masonry and/or non-concrete locations provide pressed steel boxes. Steel thickness not less than 0.062-inch, hot-dip galvanized. Knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective junction box and outlet box.
   b. UL-514 listed and labeled.
   c. Minimum required box depth is exclusive of extension-ring depth.
   d. Provide all boxes with matching cover plates. Cover plates shall be gasketed water-tight in wet and outdoor locations.
   e. Boxes installed in masonry or concrete shall be UL "concrete-tight" approved for installation in concrete and shall allow the placing of conduit without displacing reinforcing bars.
2. Provide outlet boxes of proper code size for the number of wiring devices, connecting conduits, and conductors/cables or conduits passing through or terminating therein. In

no case shall outlet box be less than 4.0-inches square by 2.125-inches deep. Unless specified elsewhere or noted otherwise on the Drawings, 2.5-inches minimum depth for box width exceeding 2-gang.

3. Increase the minimum outlet box size to 4.69-inches square by not less than 2.125-inches deep, where one or more of the following conditions occurs:
   a. More than two conduits connect to the outlet box.
   b. Circuit “Homerun” or Conduit “Homerun” connects to outlet box.
4. Signal, Communication and Low Voltage Outlet Boxes:
   a. Individual or duplex audio/visual, telephone, computer or data outlets: 4.69-inches square by 2.125-inches deep minimum with single gang wide extension ring.
   b. Combination AV/signal/telephone/data or computer outlets: 4.69-inches square by 2.125-inches deep minimum with 2-gang wide extension ring.
5. Junction boxes shall be sized to comply with the following:
   a. Code Requirements size based on the conduit quantities, conduit sizes and wire-fill connected to the junction box.
   b. Junction box minimum size shall not be less than 4.69-inches square by 2.5-inches deep, but not less than size indicated on the Drawings or required by Code.
6. Provide extension rings on flush outlet boxes and flush junction boxes, to finish face of extension ring flush to (within ±0.63-inches) of finished building surfaces. Extension ring shall match outlet box materials/construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective box and maintain "ground" bonding continuity.
7. Outlet boxes installed in outdoor locations, or in wet locations, or in concrete/ masonry, shall be cast-iron or cast-bronze, with threaded conduit hubs. UL rated for wet locations.
   a. Aluminum boxes shall NOT be in contact with concrete or masonry. Die-cast aluminum or cast aluminum water-tight electrical outlet boxes with threaded hubs may be provided as an alternative to cast-iron or cast-bronze outlet boxes, only where one or more of the following conditions occur:
      1) Outdoor locations above finish grade.
      2) Indoor wet locations surface or flush in walls or ceilings.
      3) Not in contact with concrete or masonry.
8. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
9. Provide solid gang boxes for three or more devices, typical for line and low voltage switches, receptacles, low voltage/signal outlets, etc. for mounting devices behind a common device plate.
10. Provide isolation barriers in outlet boxes:
    a. Between line voltage and low voltage devices.
    b. Where more than one device is installed in an outlet box, between and separating each device.
    c. Between 277-volt and 120-volt devices.

d. Between devices connected to emergency and non-emergency circuits of all voltages.

11. Outlet boxes installed penetrating into fire rated walls, fire rated floors, fire rated ceilings and all fire rated construction. The outlet boxes shall be UL listed, classified and labeled, for fire rated and temperature rated penetration of the respective fire rated surface and fire rated construction. The outlet box fire rating and temperature rating shall equal or exceed the fire/temperature rating of the surface/construction being penetrated. Provide UL listed and labeled supplemental fire and temperature protection to maintain ratings:
    a. Wall and ceiling penetrations, supplemental tumescent fire wrap (external or internal of outlet box).
    b. Floors provide subfloor supplemental fireproofing below floor box.
12. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for scrub water exclusion Requirements, including but not limited to tiles, carpeting and exposed wood and concrete floor fishes.
13. Outdoor flush in wall device outlet boxes:
    a. Flush in wall outlet box with corrosion resistant gasketed water tight, hinged, key locking cast metal, self-closing cover. Tamper resistant and vandal resistant.
    b. UL-listed and labeled for installation in masonry, cast-in-place concrete, hollow-framed walls and wet locations.
    c. Flush cast-iron or cast-bronze or brass, device back-box, nominal 4.68-inch square by 2.25-inch deep.
    d. Internal metal adapter plate for wiring device types, in the box as indicated on the Drawings.
    e. As manufactured by Legrand/Pass and Seymour #4600 Series; or C.W. Cole #310 Series.
14. PVC Coating
    a. Metal outlet and junction boxes installed outdoor or exposed non-weather protected locations shall be PVC coated.
    b. PVC coating shall be factory applied, to comply with NEMA-RN1 and 5-19.
    c. The adhesion of the PVC coating to the metal box shall exceed the strength of the coating itself, based on 0.5-inch "strip-pull" test.
    d. Uniform coating thickness shall be continuous without "breaks" or "pinholes" and shall not be less than the following:
        1) Box exterior surfaces, 40-millimeter coating thickness.
        2) Box interior surfaces, 10-millimeter coating thickness.
15. Refer to Architectural and Structural Contract Documents and Details for additional Box and Install Requirements.

B. Surface Outlet Boxes

1. Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than required for “press steel boxes”, and “sheet steel boxes”. Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

C. Floor Boxes

1. General:
    a. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for Scrub Water Exclusion Requirements, including but not limited to floor tiles, carpeting and exposed wood and concrete floor fishes.
    b. Electrical power receptacles in a floor box; shall be industrial grade wet location heavy-duty, high-abuse rated devices, tamper resistant. Grounding type, 125 volts, 60Hz AC, 20-amp, NEMA 5-20R (duplex), or other NEMA configurations noted on the Drawings. Standard length receptacle mounting strap as required by the Manufacturer of floor box being furnished.
    c. Tested, listed and labeled to comply with UL-514A and/or UL514C.
2. Concrete floor outlet box for chair/seat aisle light fixture connection:
    a. Flush-in -concrete floor box, brass or cast iron, nominal 18-cubic inches internal wire capacity, removable screw attached flush top cover.
    b. Minimum of three 0.75-inch conduit threaded entrances; one surface/top entrance location for aisle light fixture connection to box, plus two side and bottom locations for “in-out” branch circuit connections.
    c. The top entrance conduit position shall not interfere with removal and reinstallation of the box top cover, with the top conduit connected between the box and aisle light fixture and the top of the box set flush with finish floor surface.
    d. Box and conduit shall be protected and concealed, below each respective aisle seat containing an electric aisle light fixture. Orientation of top entrance conduit to match position of aisle light fixture.
    e. As manufactured by Hubbell #F3185 Series; no known equal.
3. Poke-Thru floor boxes for “After-Set” Floor Outlets.
    a. Through floor wiring for power and communication shall be UL listed with a fire and temperature rating of not less than 2-hours. The units shall include an internally divided floor fitting; a divided through-floor conduit/ raceway, and a divided under floor junction “split-box” not less than 4.7-inches by 4.7-inches by 2.125-inches in size. Junction box shall be installed concealed in ceiling space of the floor below. The length of the floor “through-raceway” shall match the thickness of the finish floor and as recommended by the Manufacturer. Unit shall be self-supporting with-out the attachment of an above floor fitting. Internal isolation barriers between high potential and low potential circuits and sections. The integral fire barrier shall incorporate a cold smoke barrier to prevent the passage of smoke when heat is not present.
    b. Poke-Thru Floor boxes shall contain dual services for high potential and low potential devices and circuits.
    c. Poke-Thru Floor pedestal type; (internally divided high potential and low potential sections) service fittings die cast, brushed aluminum, single piece device housing, with stainless steel device cover plates front and rear of the housing as follows:
        1) Front side (high potential) one 20-amp, 120 volt, 60Hz, AC, grounding duplex convenience outlet plugs.

2) Rear side (low potential) shall contain “knockouts” or “keystones” as follows at locations shown on the Drawings:
   a) Knockouts for signal cables one 1-inch diameter and two ⅜-inch diameter with rubber bushing grommets for each knockout.
   b) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections.
   c) The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the low voltage-signal Contract Documents.
3) Alternately where specifically indicated on the Drawings, the front and rear cover plates shall be supplied with knockouts for 1.0-inch flexible conduit “Furniture” connection, one per cover plate.
4) The pedestal shall provide 0.25-inch or greater protective over-hang (drip-lip) of the device coverplates. Provide stainless steel device coverplates.

d. Non-Pedestal Poke-Thru flush in floor type; (internal divided high potential and low potential sections) die cast, flush with finish floor, metal cover flip-open, locking, hinged access covers. Open-close die cast aluminum port-covers for plug-in portable cable connections. ADA compliant, wide trim matching flange.
   1) Two 20-amp, 120 volt, 60Hz, AC, grounding duplex convenience receptacles for high potential power connections.
   2) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the Low Voltage-Signal Contract Documents.
   3) Cover shall close and lock after portable plug-in cables have been inserted into respective connections, under the cover.
   4) UL wet mop, scrub water rated for carpeted and non-carpeted floors.
e. Die cast aluminum cover, nominal 8-inch diameter metal housing flush in “core-hole”, outlet metal body size.
f. Flush with floor or pedestal type as indicated on Drawings. As manufactured by Wiremold/Legrand# Evolution Poke-Thru 8AT Series, Smoke and Fire Rated Poke-Through fittings; no known equal.

4. Floor Boxes for Flush Floor Outlets (non-pedestal) recessed concealed inside outlet box, plug-in receptacles.
   a. Provide cast-in-floor with concrete pour pan, rated for on grade to prevent direct earth contact, cast-in-place concrete floors on-grade and above-grade; adjustable "leveling-feet" for box.
   b. UL wet mop, scrub water rated for carpeted and non-carpeted floors. UL-File E171211 installation fire rating and/or UL-Fire Resistance Classified.
   c. Floor boxes shall contain dual services:
      1) High potential with not less than two 120-volt 60Hz AC 20-amp grounding duplex convenience receptacles.
      2) Low potential for low voltage system outlets and signal circuits with up to and including eight RJ-45 plug-in keystone snap-in retainer receptacles. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the low voltage-signal Contract Documents.

3) Internal isolating barrier between high and low potential circuits and sections of box.
4) Also refer to Drawings for additional outlet Requirements.

d. Conduit knockouts in bottom of box and in each side wall of box. Not less than one 1.25-inch and one 0.75-inch knockouts for both low potential and high potential conduits connections on each opposing box side. Include the same configuration of knockouts on the bottom of the box, for high potential section and low potential sections.

e. Floor box cover:
1) Flush tamper resistant "lock-down" removable main cover. Independent hinged "flip-out" port in the removable cover, to allow main box cover to be in a fully closed position with "plug-in" cords connected into box when the lock-down cover is closed. Main cover "lock-down" to prevent non-authorized access into box interior.
2) Brass, removable recessed main cover, rated for carpet, or tile for floor finish, brass overlapping trim cover finish. Cover recess depth 0.25-inch, 0.5-inch or 0.75-inch as required to match respective floor covering thickness and type. ADA compliant, wide trim matching flange.

f. Floor box with metal body, nominal box size 10-inches by 12-inches by depth to match floor, but not less than 3.0-inches deep box.

g. Floor box as manufactured by FSR #FL-500P Series; no known equal.

2.02 PULLBOXES

A. General

1. Sizes as indicated on the Drawings and in no case of less size or material thickness than required by the Governing Code and AHJ.

2. Exercise care in locating pullboxes to avoid installation in drain water flow areas and to clear existing condition interferences.

3. UL listed and labeled for electrical circuits.

B. General Purpose Sheet Metal Pullbox

1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw attached covers. Manufacturer's standard rust proofing and baked enamel finishes.

2. Weatherproof sheet steel pullboxes: Fabricate of code gauge steel. All surfaces interior and exterior hot-dip galvanized steel. Gasketed weathertight cover of same material.

C. Concrete Pull Boxes and Hand-Holes for Electrical

1. AASHTO H-20 traffic loading rated box and cover, pre-cast concrete, steel reinforced pull boxes and hand-holes. Provide complete with pulling irons, hot-dip galvanized metal traffic cover with hot-dip galvanized metal cover frame, pull-box concrete base with sump. Four-cable full height wall racks with porcelain cable support blocks.

2. Boxes shall be “Intercept” type with Multiple Box Sections. Extension cable-intercepts at both ends of box. Refer to Drawings for box size.

3. Covers shall be flush bolt down. Covers weighing more than 40-pounds shall be split cover type “Torsion-Sping” assist, hinged open-close.
4. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide cast-or-bead weld on cover of pullbox to indicate services within pull box (i.e., "480/277-VOLT, 3-PHASE, 4-WIRE ELECTRICAL" OR “SIGNAL/TEL/P.A./ CLOCK/FIRE ALARM" etc.).
5. Shall be set on a machine-compacted pea gravel base 12-inches thick with gravel base extending 6-inches beyond box base on all sides. Provide a 0.75-inch by 10-feet copper clad ground rod through the box bottom with 9-inch projection into box, for grounding all metal parts and frames with continuous #10 AWG copper bond wire.
6. Seal all box joints and seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal. After cables have been pulled, connected, tested and inspected, seal box cover and bolt-close cover.
7. As manufactured by Jensen Precast; or Oldcastle Precast.

2.03 SWITCHES, WIRING DEVICES

A. General

1. Provide wiring device circuit switches totally enclosed, electrical insulation Bakelite or electrical insulation composition base, manual operator type with 277-volt 60Hz AC rating for full capacity contacts rated for incandescent lamp loads, fluorescent lamp loads and motor loads. Switch mounting-ears for screw attachment to outlet box. Switches shall be UL listed and labeled; conform to NEMA-WD1 and WD6.
2. Switch controlling (on-off) rated for all lighting loads and all non-lighting loads; switch ratings shall be 20-amp, unless indicated otherwise on Drawings.
3. Color as selected by Owner’s Representative. Switches and wiring devices controlling circuits connected to emergency power shall be red.
4. All switches shall be of the same Manufacturer.
5. Where switches are mounted in multiple gang assembly and are operating at 277 volts and/or 277 volts and 120 volts or emergency/non-emergency and mounted in same outlet box, there shall be an insulating barrier installed between each switch.
6. Devices shall additionally be listed and labeled as UL-All Weather-Resistant wet-location for the following install locations:
   a. Devices indicated on Drawings as Weather-Proof (W.P.).
   b. Devices installed in outdoor locations
   c. Installed in classified wet or damp area locations both indoor and outdoor.
7. Wiring devices shall be listed and labeled for connection of both “solid” and “stranded” copper circuit conductors.
8. Switches with ampere and voltage ratings different than described herein. The different rated switches shall have the same characteristics and performance as the respectively described switches, except for differing ampere and voltage characteristics.

B. Switches Heavy Duty (Toggle – Type)

1. Single Pole Switches – 20 amp at 277V

Manufacturer	Toggle Type	Lock Type
Hubbell	#HBL1221	#HBL1221-L
Legrand/P&S	#20AC1	#20AC1-L
Leviton	#1221	#1221-L
Cooper-Arrow/Hart	#AH1221	#AH1221-L

2. Double Pole Switch – 20 amp at 277V

Manufacturer	Toggle Type	Lock Type
Hubbell	#HBL1222	#HBL1222-L
Legrand/P&S	#20AC2	#20AC2-L
Leviton	#1222	#1222-L
Cooper-Arrow/Hart	#AH1222	#AH1222-L

3. Three-Way Switches – 20 amp at 277V

Manufacturer	Toggle Type	Lock Type
Hubbell	#HBL1223	#HBL1223
Legrand/P&S	#20AC3	#20AC3-L
Leviton	#1223	#1223-L
Cooper-Arrow/Hart	#AH1223	#AH1223-L

4. Four-Way Switches – 20 amp at 277V

Manufacturer	Toggle Type	Lock Type
Hubbell	#HBL1224	#HBL1224-L
Legrand/P&S	#20AC4	#20AC4-L
Leviton	#1224	#1224-L
Cooper-Arrow/Hart	#AH1224	#AH1224-L

5. Momentary Contact Switches – 20 amp at 277V

Manufacturer	3-Position Regular	3-Position Lock
Hubbell	#HBL1557	#HBL1557-L
Legrand/P&S	#1251	#1251-L
Leviton	#1251	#1251-L
Cooper-Arrow/Hart	#AH (extra)	#AH (extra)

6. Maintained Contact Switches (Double Throw, Center Off) – 20 amp at 277V

	Toggle Type		Lock Type	
Manufacturer	1-Pole	2-Pole	1-Pole	2-Pole
Legrand/P&S	#1225	#1226	#12250L	#1226-L
Hubbell	#HBL1385	#HBL1386-L	#HBL1385-L	#HBLM1386-L
Leviton	#1385	#1386		
Cooper-Arrow/Hart	#AH (extra)	#AH (extra)	#AH (extra)	#AH (extra)

7. Pilot lights used in conjunction with circuit switches shall be LED type with red jewel.

C. Switches – Shall be Decorator (“Rocker” type operations) Style, for residential locations only.

1. 120-volt 60Hz AC, rated 15-amp for lighting loads and rated 20 amp for non-lighting loads, unless indicated otherwise on Drawings.

2. Single Pole Switches

Manufacturer	Rocker Type
Legrand/P&S	#TM870
Hubbell	#RSD115
Leviton	#5621-2
Cooper-Arrow/Hart	#7501

3. Double Pole Switch

Manufacturer	Rocker Type
Legrand/P&S	
Hubbell	#RSD215
Leviton	#5622-2
Cooper-Arrow/Hart	#7502(extra)

4. Three-Way Switches

Manufacturer	Rocker Type
Legrand/P&S	#TM873
Hubbell	#RSD315
Leviton	#5623-2
Cooper-Arrow/Hart	#7503

5. Four-Way Switches

Manufacturer	Rocker Type
Legrand/P&S	#TM874
Hubbell	#RSD415
Leviton	#5624-2
Cooper-Arrow/Hart	#7504

6. Momentary Contact Switches

Manufacturer	3-Position Regular
Legrand/P&S	#TM870 (extra)
Hubbell	#RSD (extra)
Leviton	#5624-2
Cooper-Arrow/Hart	#7521

7. Maintained Contact Switches (Double Throw, Center Off).

	Rocker Type	
Manufacturer	1-Pole	2-Pole
Leviton	#5685-2	#5686-2

8. Pilot lights used in conjunction with circuit switches shall be LED type with red jewel.

D. Weather-Proof (W.P.) Switches

1. Outdoor switches provide heavy-duty, tamper resistant gasketed weather proof metal, hinged door cover for each switch.
2. Cover door shall be key locking-type or padlock-type.

E. Other Switches, Receptacles, Devices, and Outlets

Special devices outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.04 ELECTRIC RECEPTACLE WIRING DEVICES

A. General

1. All receptacle wiring devices in flush type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Receptacle mounting-ears for screw attachment to outlet box. Receptacle shall be UL listed and labeled; conform to NEMA-WD1 and WD6.
2. All receptacles shall be a product of the same Manufacturer.
3. Receptacle color as selected by Owner's Representative. Receptacles connected to emergency power circuits shall be red.
4. Tamper Resistant Receptacle
   a. Devices shall additionally be listed and labeled as tamper resistant, provide tamper resistant receptacles in buildings containing dormitories, condominiums, guest-rooms, housing/residences, apartments, dwellings, hotels/motels, classrooms, secondary schools K through 12th grade, childcare/daycare/kindergarten, hospital pediatric-care units and other locations required by AHJ.
   b. The electrical receptacles shall be rated "Tamper-Resistant-Receptacle" (TR), UL-TR (RTRT). Spring loaded shutters shall automatically open-close (unblock-block) the receptacle slots, when the plug-in (cap) insertion and removal occurs.
   c. Typical for 15-amp and 20-amp receptacles. Modify Manufacturer's catalog number description to include tamper resistant receptacle function.
5. Wiring devices shall be listed and labeled for connection of both "solid" and "stranded" copper circuit conductors.
6. Duplex convenience receptacles and 120-volt single phase branch circuits.
   a. Duplex (convenience) receptacle, wiring device with two single receptacles with the same electrical rating, integrated into a single assembly by the Manufacturer.
   b. 20-amp branch circuits with a single duplex convenience receptacle connection on each circuit, receptacles shall be rated for 20-amp.
   c. 15-amp and 20-amp branch circuits with two or more duplex convenience receptacle connections each circuit, receptacle shall be rated 15-amp or 20-amp.
7. Devices shall additionally be listed and labeled as UL-All Weather-Resistant, provide weather resistant receptacles for the following install locations. Modify Manufacturer's catalog number descriptions shall include all-weather-resistant UL listing and labeling:
   a. Devices indicated on Drawings as Weather-Proof (W.P.).
   b. Devices installed in outdoor locations.
   c. Devices installed in classified as damp or wet locations both indoor and outdoor.
   d. All GFCI (ground-fault) receptacles all locations.

8. Receptacles with ampere and voltage ratings different than described for duplex convenience receptacles. The different rated receptacles shall have the same characteristics and performance as the respective duplex convenience receptacles, except for differing ampere and voltage characteristics. Refer to "Floor Boxes" for additional Receptacle Requirements".
9. Receptacles shall be GFCI type for the following locations:
    a. located within 84-inches of a sink or hosebib shall be GFCI receptacles.
    b. Devices installed in outdoor locations.
    c. Devices installed in classified as damp or wet locations both indoor and outdoor.
    d. Devices indicated on Drawings as GFCI or Weather-Proof (W.P.).
10. "Split-wire" duplex convenience receptacles. Each split-wire receptacle plug connects on independent common circuit. Provide nameplate or graphic on face of receptacle describing the receptacle function and control source. Comply with California Title-24 and ASHRAE-90.1, latest revisions.

B. Duplex convenience receptacles.

1. Shall be grounding type, 120 volt and shall have two current carrying contacts and one grounding contact which are internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired. Receptacles shall be tamper resistant–TR, UL-TR.
2. GFCI receptacles shall be all Weather-Resistant and wet location rated. Duplex rated 120-volt 60Hz AC, 20 amp, unless indicated otherwise on Drawings.
3. Heavy Duty Industrial Grade

Manufacturer	NEMA 5-15R	NEMA 5-20R	NEMA 5-20R-GFCI
Legrand/P&S	#5262 . . …….	#5362 . . …….	#2095HG
Leviton	#5262. . …….	#5362 . . ……..	#W7899
Hubbell	#CR5252. ……..	#5362 . . …….	#GFR8300
Cooper-Arrow/Hart	#AH5262. ……..	#AH5362 . ….	#WRVGF20

C. Isolated Ground Receptacles-IGR

1. The receptacle insulation barrier shall isolate the receptacle ground contact system from ground. Connect the ground plug contact to a separate dedicated insulated ground-bonding conductor. The receptacle ground plug contact shall not be grounded to the raceway or outlet box. Isolated ground duplex convenience receptacle 20-amp minimum, with two current carrying contacts and one grounding contact, or as noted on the Drawings.
2. High-abuse, heavy-duty industrial grade, NEMA 5-20R, duplex convenience receptacles.
3. Identify receptacle with an orange triangle on the receptacle face and orange receptacle body. Red body for receptacles connected to emergency power.

Manufacturer	NEMA 5-20R
Legrand/P&S	#IG6300
Leviton	#5362IG
Hubbell	#CR5352IG
Cooper-Arrow/Hart	#IG5362

D. Hospital Grade Duplex Convenience Receptacles

1. Receptacles shall be Underwriters Laboratories listed hospital high abuse, heavy-duty rated grade.
2. Duplex convenience receptacles shall be grounding type 120 volt with two current carrying contacts and one grounding contact which is internally connected to the frame. Outlets shall accommodate standard parallel blade cap and is side wired.
3. Ground Fault Circuit Interrupter (GFCI or GFI) 20-amp duplex convenience receptacles with test-reset buttons and visual pilot. Shall be all Weather-Resistant and wet location rated.

Manufacturer	NEMA5-15R	NEMA5-20R	NEMA5-20R-GFCI
Legrand/P&S	#8200HG	#8300HG	#2095HG
Leviton	#8200HG	#8300HG	#HG-7899
Hubbell	#8200	#8300	#GFR8300
Cooper-Arrow/Hart	#AH8200	#AH8300	#TRVGFH20

E. Weather Proof (W.P.) Receptacle

1. Outdoor receptacles shall be duplex convenience GFCI type rated 20-amp 120 Volt 60Hz AC weatherproof, GFCI, unless indicated otherwise on Drawings. Test-reset buttons and visual pilot.
2. GFCI receptacles shall be wet location and Weather-Resistant rated weatherproof, gasketed, key locking tamper resistant, wet location.
3. Outdoor, flush mount outlet with hinged, key-locking, weather-proof cover (CEC – 406.8 compliant). As manufactured by Pass and Seymour/Legrand #4600 Series; or C.W. Cole #310 Series.
4. On exposed conduit runs, provide weatherproof ground fault circuit interrupter type GFCI receptacles installed in "FS" condulet water tight cast metal body, with weather-proof spring door type covers, gasket water tight. Door shall be key locking-type or pad-lock-type.

F. Duplex convenience receptacles, for residential locations only.

1. Receptacles shall be “Decorator” type, grounding type, 120 volt, 60Hz AC, and shall have two current carrying contacts and one grounding contact which are internally connected to the frame.
2. Outlet shall accommodate standard parallel blade cap and shall be side wired.
3. GFCI receptacles shall provide test-reset buttons and visual pilot. Rated 120-volt 60Hz AC, unless indicated otherwise on Drawings. GFCI receptacles shall be wet location and all Weather-Resistant rated.
4. Tamper Resistant Receptacles
   a. All the electrical receptacles shall be rated “Tamper Resistant Receptacles” for 120 volt, 15-amp and 20-amp (TR), UL-TR (RTRT). Spring-loaded shutters shall automatically open-close (unblock-block) the receptacles slots, when the plug-in (cap) insertion and removal occurs.

Manufacturer	NEMA 5-15R	NEMA 5-20R	NEMA 5-20R-GFCI
Legrand/P&S	#885TR	#TR26362	#2095TRWRW

Leviton	#T5325	#T5825	#W7899TR
Hubbell	#RRD15STR.	#RRD20STR	#GFTR20
Cooper-Arrow/Hart	#TR1107	#TR6350	#TWRVG20

G. Other Switches, Receptacles, Devices, and Outlets.

1. Special devices, outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.05 PLATES

A. Metal Cover Plates for Devices

1. Provide cover plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device outlets.
   a. All line voltage circuit plates shall be metal, 0.040-inch stainless steel Type 302 alloy, composed of 18% chromium and 8% nickel.
   b. Plates for low voltage signal systems may be metal or non-metal. Non-metal plates shall be high-abuse, hard-service and high-impact resistant.
2. Plates shall be as manufactured by P&S; or Hubbell; or Leviton; or General Electric.

B. Residential Location Project non-metal cover plates for line voltage and low voltage devices.

1. Provide plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device outlets. Non-metal, heavy-duty, high-abuse and high-impact resistant plates.
2. Plates shall be same Manufacturer as the respective wiring device.

2.06 VANDAL-PROOF FASTENINGS

Provide approved vandal-proof type screws, bolts, nuts where exposed to sight throughout the Project. Screws for such items as switch plates, receptacle plates, fixtures, communications equipment, fire alarm, blank covers, wall and ceiling plates to be spanner head stainless steel, tamperproof type. Provide OWNER with six screwdrivers for this type.

2.07 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, shall be hot-dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.08 FLASHING ASSEMBLIES

A. General

1. Flashing shall be compatible with the material being penetrated and with the pipe passing through the flashing. Coordinate with and comply with Manufacturer's recommendations, for both the flashing and the material being penetrated.
2. Provide lead metal flashing assemblies at all roof penetrations, unless recommended otherwise by Manufacturer.

3. Seal the joint between the flashing and pipe passing through the flashing with water-proofing compound.
4. Lead flashing for roof penetrations, as manufactured by: Santa Rosa Lead Products; or Semco; or Flashco.

B. Storm Collars

1. In addition to penetration flashing, provide storm-collar counter-flashing for each roof penetration flashing. Shall attach to the structure of the penetration and form a water-tight "umbrella" counter flashing over the roof penetration flashing.
2. As manufactured by: STD-Storm collars; or ASI-Storm collars.

2.09 RELAYS, CONTACTORS, AND TIMESWITCHES

A. Individual Control Relays (HVAC Plumbing of the Control Functions)

1. Individual control relays shall have convertible contacts rated as a minimum of 10 amp, 600 volts regardless of usage voltage. Coil voltage, number and type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the Electrical and Mechanical Drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type I enclosure unless indicated otherwise.
2. The following relays are approved:

Manufacturer	Type
Cooper-Arrow/Hart	IMP
General Electric	Class CR 2811
Square D Co.	Class 8501, Type A
Westinghouse	Bul. 16-321, Type NH
Allen Bradley	Approved Equal

B. Contactors and/or Relays

1. Contactors and/or relays for control of lighting shall be 600-volt AC, electrically operated, and mechanically held units, open type for panel mounting with number of poles and of size as indicated on the Drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a 2-wire control circuit.
2. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the Drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.
3. Contactors and/or relays shall be Automatic Switch Co. Bulletin #920 Series for 2-pole and 3-pole, Automatic Switch Co. Bulletin 917 Series with poles as indicated on Drawings. Coil control circuit shall be independently fused, sized to protect coil.
4. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

C. Time-Switches

1. All timeswitches shall have synchronous motor drive for operation on 120 or 277 volts, 60Hz, AC and shall be furnished with a 10-hour, spring-driven, reserve-power motor. Contacts shall be rated 40-amp per pole.
    a. Exterior lighting timeswitches for control of individual circuits or electrically operated relays shall have astronomic dial and shall be Tork 7000ZL Series or approved equal by Paragon or Intermatic.
    b. Interior lighting timeswitches for control of individual circuits or electrically operated relays shall be Tork 7000 Series or approved equal by Paragon or Intermatic.
    c. Timeswitches for control of air conditioning or plumbing equipment shall have 7-day dial and shall be Tork WL Series or approved equal by Paragon or Intermatic.
2. All timeswitches shall be mounted in separate section in top of panelboards under separate lockable door unless otherwise indicated on Drawings. Clear opening for time-switch shall be a minimum of 12-inches by 12-inches.

D. Contactors and/or Relays/Timeswitch Cabinet

1. Contactors, relays, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed, same as panelboards. Construction of cabinet shall be similar to terminal cabinets.
2. Each contactor, relay or timeswitch mounted in the contactor cabinet shall be barriered in its own compartment and shall be installed on Lord sound absorbing mounts.
3. Contactor cabinets shall be of the same Manufacturer as the panelboards.
4. Where relays and/or contactors occupy the same enclosure as timeswitches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by nonauthorized personnel.

2.10 DISCONNECTS (SAFETY SWITCHES)

A. General

1. Disconnect switches shall all be rated:
    a. 600-volt 60Hz AC for all disconnect safety switches.
    b. NEMA Type HD, quick-make, quick-break, H.P.-rated.
    c. Fused Class "R", in NEMA Type I indoor location enclosure. Where enclosure is indicated outdoor or W.P. (Weather-Proof) switches shall be rain tight NEMA 3R enclosure. Lockable access door.
    d. Number of poles horse power rating and amperage as indicated on the Drawings.
2. Provide internal neutral bus, ground-lug and conductor landing lugs, size to match conductors shown on Drawings. Switch access door shall be interlocked with switch to prevent access inside switch when switch is “on” closed position.
3. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.
4. Disconnect switch and fuses ampere rating shall also comply with Manufacturer’s recommendation for the connected load.

2.11 SPARE FUSE CABINETS

Provide a cabinet in each room where a switchboard or motor control center is installed and contains fuses. Cabinets shall be as specified for "Terminal Cabinets" and shall be of sufficient size to contain all spare fuses hereinbefore specified. Provide clips (two per fuse) for each spare fuse. Mount clips in plywood backboard in cabinet. Label cabinet "SPARE FUSES".

2.12 CONCRETE WORK (ADDITIONAL REQUIREMENTS)

A. Portland Cement

1. ASTM C33- (latest revision), Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.
    a. Concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, concrete shall attain minimum 28-day compressive strength of 4000psi, using not less than 5.75 sacks of cement per cubic yard of wet concrete.
    b. Concrete for underground duct/conduit encasement, the minimum 28-day compressive strength shall be 2000 psi. Provide a minimum of 10-pounds of red oxide concrete coloring per yard of concrete.
    c. Mix shall obtain a 6-inches slump, measured with standard slump cone per ASTM C143/C143M (latest revision).
2. Coarse Aggregate: Uniformly graded between maximum size not over 1½-inch and not less than 0.75-inch and minimum size #4, crushed rock or washed gravel. For concrete encased conduit only, maximum aggregate size shall be ½-inch.
3. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing ⅜-inch screen, of which at least 12% shall pass fifty mesh screens.

B. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.

C. Reinforcement

1. Bars: Intermediate Grade Steel conforming to ASTM A615/A615M Grade 60, with pattern deformations.
2. Welded Wire Fabric: ASTM A185/A185M.
3. Bending: Conform to Requirements of ACI 318.

D. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1-inch by 6-inch boards. Forms for round lighting pole bases shall be sono-tube.

2.13 SURGE PROTECTION DEVICE (SPD) – DIRECT CONNECT

A. General

1. The unit shall be modular in construction and operate in parallel with 60Hz AC line voltage, 4-wire or 5-wire, grounded or ungrounded systems, as applicable; voltage, kVA and ampere capacity as indicated on the Drawings. Suitable for direct connection through an external circuit breaker or combination switch/fuse protective device rated 30-amp, continuous duty, rated for Service Entrance equipment connection.

Electrical surge protection sequences shall include circuit configurations as follows:

a. Line-to-Line (Phase-to-Phase).
b. Line-to-Ground (Phase-to-Ground).
c. Line-to-Neutral, where neutral is present.
d. Ground-to-Neutral, where neutral is present.

2. The unit shall operate correctly with any combination of resistive, inductive, or capacitate loads. The unit shall automatically shunt to ground the electrical transients and EMI/RFI noise occurring above the specified values. The unit shall automatically reset after transient condition has passed. Operating temperature minus 40° centigrade to plus 85° centigrade.
3. Provide one or more individual self-contained protection module(s) for each line voltage phase, ground and neutral, suitable for direct connect with line-side C/B protection and disconnect. Provide one spare individual plug-in protection module. Provide incoming line, neutral and ground conductor termination lugs rated CU/AL #14 through #4 AWG. Lugs shall be barriered from and prewired to the respective protection modules.
4. Provide a NEMA twelve housing to contain all unit modules, devices and conductor terminations. The housing shall include a hinged pad-lockable access door.
   a. Flush housing for mounting internally inside related equipment.
   b. Surface mounted, with conduit entrance knockouts for external mounting. Maximum housing size shall not exceed 36-inches wide by 72-inches high by 8-inches deep.
5. As manufactured by Total Protection Solutions Model #ST-SPD; or MCG Electronics; or Advantage Protection Technologies, Inc.

B. Operational Characteristics

1. Surge protection device, testing, listing and certification.
   a. UL 1449 (latest edition) and CSA listed and labeling, for Surge Protection Device Suppresser, UL 1283 for transient voltage electrical noise attenuation, ANSI/IEEE C62.45, C62.1 for C62.41, (latest edition) bi-directional transient clamping voltages for both Normal Mode and Common Modes against Category A and B ring wave and Category B impulse wave.
   b. The unit connected to the service entrance shall also withstand a minimum of 2,000 sequential ANSI/IEEE C62.41 Category C surges without failure following IEEE Test procedures in C62.1, C62.41 and C62.45.
2. Surge protection device, EMI noise rejection, and RFI noise rejection shall be provided for Common Mode (line-to-neutral and line-to-ground), Normal Mode (line-to-line) and neutral to ground.
3. EMI and RFI noise rejection.

   Conducted line noises interference between both Electromagnetic (EMI) and Radio Frequency (RFI) shall be reduced by the unit over a continuous spectrum of 0.5MHz to 1.0MHz. The basis for reduction shall be a standardized 50-OHM insertion loss MIL -STD-220A test. Provide Spectrum Analysis Test dB attenuation reports showing RFI filtering

over specified frequencies. Test data based on calculated, or computer simulation is not acceptable.

4. Three phase and grounded "WYE" Performance Requirements.

Characteristics	208/120 Volt	480/277 Volt
Nominal line-to-line	208 Volt	480 Volt
Nominal line-to-neutral	120 Volt	277 Volt
Internal capacitance (Microfarads)	2.5	2.5
Maximum response time	1-nanosecond	1-nanosecond
EMI/RFI noise rejection	25-35dB	25-35-dB
Nominal peak clamp voltage line-to- neutral and line-to-ground	500 Volts	900 Volts
Minimum transient energy dissipation per phase (at 8x20 microseconds waveform)	1000 Joules	1500 Joules
Peak transient withstand (at 8x20 micro-seconds waveform) without failure of the unit	50,000 amp	60,000 amp
• Category-C3	300,000 amp	500,000 amp
• Category-B3	100,000 amp	150,000 amp
• Category-A3	60,000 amp	80,000 amp

C. Diagnostic Indicators

1. Shall display the "Normal" and "Fault" status of each line suppression circuit, along with protection circuit "on" indication.
2. Shall provide a sonic audible fault alarm with silence push-button.

D. Surge Protection Categories

1. Surge protectors shall comply with ANSI C62.41 (Latest Revision) Standard Protection Categories for "impulse" and "ringwave" transients, based on the installation locations shown in the Contract Documents.
   a. Service entrance, main switchboard or substation locations - Category "C3", high exposure, Type-1.
   b. Mid building, distribution panels, distribution panels over 400-amp main bus rating locations - Category "B3", high exposure, Type-1.
   c. Branch circuit panelboards 400-amp or less main bus rating - Category "A3", high exposure, Type-1.
2. The SPD short circuit current withstand rating shall exceed the actual short circuit current available at the SPD installation location

2.14 PLUG STRIP SURGE PROTECTION DEVICE

A. General:

1. Point-of-Use Type-3 self-contained unit rated 15-amp, nominal 120 volt plus-or-minus 10%, 60Hz, AC, 1875 watts full continuous load. Internal 15-amp resettable overload protection circuit breaker. Red illuminated on-off switch. 6-foot, 14 AWG 3-conductor, grounded, heavy duty jacketed AC line cord with NEMA 5-15 cap. Multi-outlet receptacles, suitable for use with the following types of plug-in loads, data processing equipment, audio/video equipment, test instruments, medical equipment, photo graphic equipment and "switching type" power supplies.

2. Protected outlets shall be NEMA 5-15R 15-amp, AC 60Hz receptacles. Provide four protected outlet plugs on each plug strip, as indicated on the Drawings. Each group of two receptacles (duplex) shall be connected to separate protected load isolated filter banks. Each duplex shall be isolated from the other output receptacles, minimum isolation of 25dB at 1MHz line to line, line to neutral, line to ground and neutral to ground.
3. Non-blocking plug-in locations/orientation for plug-in "power-brick" power supplies, without obstructing adjacent receptacles.
4. As manufactured by TRIPP LITE-Isobar Series; or Advanced Protection Technologies; or equal.

B. Operation:

Self-contained RFI and EMF shielded housing with mounting slots for temporary mounting of the unit. Protected outlet receptacles shall supply filtered, electrical line voltage power to the connected equipment. Line noise RFI and EMI interference filtering suppression, surge protection and spike protection shall occur in all three modes of operation line to ground, line to neutral and neutral to ground rated as follows:

1. 13,000-amp, 210 joules (watt-seconds) peak withstands capacity.
2. Transient response time less than five nano seconds.
3. 140-volt AC RMS initiate spikes suppression 330 volt maximum let through.
4. RFI and EMI Suppression-Provide Spectrum Analysis Test dB attenuation reports showing RFI filtering over specified frequencies.

   50KHz greater than 20dB

   150KHz greater than 40dB

   1MHz greater than 80dB
5. Diagnostic indicator lights located on the SPD housing shall provide alarm alert for each of the following conditions:
   a. Loss of AC power.
   b. Damage, malfunction in the SPD circuits.
   c. Improper AC electrical outlet wiring.
6. Standards Testing, Listing, Labeling and Certification Compliance, latest revisions:
   a. IEEE 587 A and B compliance.
   b. UL 1449 surge protection device
   c. UL 1363 temporary power taps.
   d. UL 1283 electromagnetic interference filters.

C. Rack Mounted SPD

1. SPD units installed in equipment racks shall comply with all the same Performance Requirements, except as follows.
   a. EIA/TIA – Equipment rack mount style (19-inches or 24-inches as applicable).
   b. Minimum of two front mounted receptacle outlets and not less than six rear mounted receptacle outlets.
   c. 20-amp 120-volt 60Hz AC electric circuit rating, instead of 15 amp.

2.15 WIREWAY

A. General:

1. Unobstructed lay in type, metal wireway, fittings and connectors UL listed for use as wireway and auxiliary gutter. Length, elbows and "T-S" as shown on Drawings. Minimum cross-section size 4-inches by 4-inches, but not less than shown on the Drawings. Suitable for mounting in any position orientation.

B. Construction:

1. Minimum metal gauge shall not be less than 14-gage.
2. Cover shall be hinged entire length of cover. Cover shall be held in the closed position with bolts and nuts.
3. Provide spring nuts on all hardware fastener penetrations into the interior of the wireway to protect against wire insulation damage.
4. The inside of 90-degree corners in the wireway shall be a 45-degree bevel.
5. Grounding continuity between wireway sections and fittings shall be continuous the entire length of the wireway.

C. Finish:

1. Indoor non-raintight, rust inhibitor phosphatizing base coating and baked enamel finish, Manufacturer's standard color.
2. Raintight outdoor-galvanized metal, with corrosion resistant phosphate primer and baked enamel finish, Manufacturer's standard color, NEMA 3R construction.
3. All hardware shall be plated to prevent corrosion.

PART 3 EXECUTION

3.01 GROUNDING (ADDITIONAL REQUIREMENTS)

A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State of California and Local Authorities Having Jurisdiction.

B. Each pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. The Maximum Resistance to Ground shall not exceed 5 ohms.

3.02 OUTLET AND JUNCTION BOXES

A. General:

1. Accurately place boxes and securely fastens to structural members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together in a horizontal row as possible. Where the outlet boxes for switches and receptacles are shown at the same location and mounting height, mount in common outlet box with barriers between devices. Provide single piece multi-gang cover plate for

close mounted outlet boxes. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.

2. Flush mounted boxes shall be attached to not less than two parallel studs or structure members by means of metal supports. The supports shall span between and attach to the structure members.
3. Boxes above accessible ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of hanger rods and/or preformed steel channels. Boxes shall be supported independently of all piping, ductwork, equipment, ceiling hanger wires and suspended ceiling grid system.
4. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.
5. Floor boxes shall be installed at a level with finish floor and within adjustable limits of floor ring. Where outlets are shown at same or adjacent location, use multi-gang boxes.
    a. Provide cut-outs in the sub-floor assembly, to accept the recess depth of each electrical floor box. Provide added “fire-proof” applications on the bottom of each floor box location extending through the sub-floor. The “fire-proof” application shall be equal to the floor fire-assembly withstand rating.
    b. Poke-thru floor outlets, core drill floor for installation of poke-thru. Install “split-box” in the ceiling space of the floor below. If the ceiling space of the floor below is not accessible ceiling type (lift-out), then provide 12-inches round removable fire-rated stainless steel access panel and trim-ring in the finish ceiling for hand-access to poke-thru “split-box” above the ceiling.
6. Outlet Box Horizontal and Vertical Separation: Outlet boxes and device outlet rings installed flush in walls shall be horizontally and vertically separated by not less than 24-inches (edge of box to edge of box) from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall.
    a. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
    b. The backing shall extend the width of the wall cavity (i.e., between "studs" or masonry cells) behind the box and 12-inches above and below the outlet box centerline, completely enclosing the outlet box.
    c. The backing shall consist of the following:
        1) ⅝-inch thick gypsum board anchored in place for "stud" wall construction.
        2) Solid "mortar" to completely fill the outlet box "cell" behind the box in masonry construction.
7. Provide metal outlet box for each device. Install devices in metal outlet boxes. Typical for all wiring devices including switches, receptacles, line voltage devices, and low volt-age/signal system devices.

B. Fire Wrap:

1. In fire-rate walls and ceilings provide fire rated "box-wrap" around the outside of each outlet box placed in fire rated wall or ceiling. Install the fire wrap on exterior of box

inside the wall or ceiling, to maintain the fire rating of wall or ceiling with the installed outlet boxes.

3.03 SWITCHES AND RECEPTACLES-DEVICES

A. General

1. Provide outlet boxes for all devices, switches, receptacles, both line-voltage and low-voltage.
2. Devices installed in wireways shall be installed flush in wireway assembly.
3. Install and screw attach devices into outlet boxes and wireways.
4. Provide ground circuit connections to all devices.
5. Provide branch circuit connections to all devices.
6. Provide testing and commissioning for proper operation and phase/ground connectors.
    a. Test each GFCI devices and Arc-Fault devices after installation and circuit connection is complete.
    b. Test all devices for correct polarity and proper electrical energization.
    c. Test On-Off operation of automatically controlled outlets and receptacles.
7. Install and adjust all coverplates to be flush and level, with correct device and circuit identification.
8. Were one or more device occurs at the proximity with other similar devices, all the devices shall be “granged” under one common coverplate as follows:
    a. Duplex convenience receptacles with other proximity (within 18-inches) duplex convenience receptacles.
    b. Lighting control switches not exceeding 20-amp switch rating with other proximity (within 18-inches) similar switches.

B. Line-voltage Plug-In Type Receptacle Installation Orientation:

1. The “ground-pin” shall face “up” at the receptacle top location (double duplex) 4-plex, individual and vertically mounted individual duplex receptacles.
2. The “neutral-blade” shall face “up” at the receptacle top location on horizontally mounted duplex receptacles.

3.04 CONCRETE WORK

A. Form:

1. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
2. Build in and set up all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the Electrical Work. Place all items carefully, true, straight, plumb, and even.
3. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.

B. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1½-minutes.

C. Transit Mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90-minutes from time of introduction of cement and water to mixer.

D. Placing of Concrete

1. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
2. Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 24-diameters, min; lap fabric one mesh min. Tie intersections, corners, splices with 16-gallon annealed wire, or as otherwise called for.
3. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting is used, avoid segregation. In placing new concrete against existing concrete, use bonding agent per Manufacturer's directions.
4. Give careful and thorough attention to curing concrete. Keep concrete and forms wet for a minimum of 10-days, after placing concrete.

E. Concrete Finish

1. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.
2. Exposed lighting pole bases shall be filled and sack finished to a smooth finish.
3. Remove concrete pour-forms.

3.05 SURGE PROTECTION DEVICE INSTALLATION (SPD)

A. Direct connect SPD Installation

1. Install unit cabinet to ensure a maximum connected circuit length of less than 5-feet from the equipment the surge protection unit is connected to, approximately plus 48-inches on wall.
2. Alternately, factory install SPD unit directly into respective equipment, instead of remote from equipment. Install SPD inside respective switchgear, switchboards, distribution panels, panelboards, etc.
3. Connect between transient surge unit and supply equipment with not less than 1.25-inch conduit containing 5#4 AWG, copper conductor, 600-volt THHN /THWN insulation, connection circuit.
4. Provide a sub-feed overcurrent protective device in the respective panel or switchboard to supply the SPD connection circuit, whether or not shown on the Drawings. The protective sub-feed device shall be a thermal magnetic circuit breaker rated not less than 30-amp 3-pole or a safety switch and fuse unit rated not less than 60-amp 3-pole, voltage and short circuit fault interrupting class to match the respective circuit voltage.
5. Connect surge protection unit to main building ground bus or electric distribution equipment ground bus (whichever is closer distance), with 1.25-inch conduit - 1#4 AWG copper conductor 600 volt, THHN/THWN insulation.

B. Plug-in type SPD

1. Install in respective equipment racks.
2. Install at respective workstation locations, cabinets and furniture.
3. Connect to respective equipment and wall electrical outlets.

C. Install, Connect, and Test each SPD Unit in Accordance with Manufacturer's recommendations.

3.06 WIREWAY INSTALLATION

Wireway hangers shall provide clamp type, hanger rod type, direct bolted bracket type from ceiling or walls as indicated on the Drawings and required for field installation locations. Supports shall be installed a minimum of 5-feet on center.

END OF SECTION 26 05 01
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SECTION 26 05 30
CONDUIT AND WIRE

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 this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit product data sheets for all wire, support, conduit, fittings and splicing materials.

B. Submit material list for all conduit and conduit fittings.

C. Submit Details and Structural Engineering Calculations for conduit support systems.

PART 2 PRODUCTS

2.01 CONDUIT

A. General

1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer's recommendations and based on Applicable Codes.
3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable code Requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:
    a. RMC and EMT conduit fittings.
        1) 0.5 inch through 1.5-inch conduit/fitting size, 10,000-amp RMS.
        2) 2.0 inch and larger conduit/fitting size, 20,000-amp RMS.
    b. FMC and LTFMC Conduit Fittings
        1) 0.5 inch through 1.25-inch conduit/fitting size, 1,000-amp RMS (without external bonding jumper).

2) 1.5 inch through 4.0-inch fitting size, 10,000-amp RMS with bonding jumper.

4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:
   a. Clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
   b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
   c. Threads shall be hot-dip zinc coated after machine fabrication.
   d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
   e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/fitting.
5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
6. Metal conduit termination connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.
7. Provide conduit bonding/grounding jumper from metal enclosures with "concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.

B. Rigid Metal Conduit (RMC)
1. Rigid metal, round tubing, machine threaded at both ends.
   a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor, pursuant to applicable codes.
2. RMC raceway types shall be as follows:
   a. Rigid Galvanized Steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA Standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); UL 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
   b. Intermediate steel Conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).
3. RMC fittings:
   a. Fittings shall be compatible with RGS and IMC.
   b. Fittings shall be rated "liquid tight".
   c. Fittings imbedded in concrete shall be rated "liquid tight" and "concrete tight".
   d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.

e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

f. Conduit seal fittings:

1) Conduit seals shall prevent the passage of gasses, liquids and vapors past the location of the seal installation in the conduit.

2) Conduit seals shall be suitable for installation in both vertical and horizontal conduit locations.

3) Conduit seals shall be visible and accessible for inspection after installation is complete.

4) Conduit seals shall be rated for the following locations:

a) Wet locations

b) Classified hazardous location materials CEC Class 1 Division 1.

c) Temperature ranges from 0 degrees centigrade through 90 degrees centigrade.

5) Conduit seals, sealing compound and sealing compound dam shall be the products of the same Manufacturer.

4. RMC fittings as manufactured by:

a. For threaded enclosure, termination connection.

1) Thomas & Betts - 106 Series bonding locknut, 5302 series sealing ring with stainless steel retainer.

b. For non-threaded enclosure, termination connector.

1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.

2) Emerson-OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.

c. For RMC-to-RMC conduit-to-conduit coupling

1) Thomas & Betts/Erickson - 674 (threaded) Series

2) Emerson-OZ/Gedney Type TPC (threaded) Series

3) Threaded RMC conduit couplings, product of the same Manufacturer as the RMC conduit.

d. For RMC Conduit Seals

1) Emerson-OZ/Gedney-EYA and EYAM (threaded) Series

2) Appleton-EYF and EYM (threaded) Series

C. Electrical Metallic Tubing (EMT)

1. Rigid metal round tubing, “thin wall” steel construction, with non-threaded ends.

a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor pursuant to applicable Codes.

b. The conduit shall be watertight and airtight without cracks and pinholes.

2. EMT shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.

3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).

4. EMT fittings:
    a. Connectors and couplings for terminating, connecting and coupling to EMT conduit shall be non-threaded steel fabrication.
    b. EMT termination connector fittings shall be as follows:
        1) Set screw type “concrete tight” when installed in dry interior locations.
        2) Compression types “raintight” and “concrete tight” when installed in wet or damp locations, outdoors and in concrete or masonry construction.
    c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.
5. EMT fittings as manufactured by:
    a. For threaded and non-threaded enclosure, termination connector
        1) Thomas & Betts-TC721A (set screw type) Series (with locknuts).
        2) Emerson-OZ/Gedney-TC500I (set screw type) Series (with locknuts).
        3) Thomas & Betts-5123 (compression type) Series (with two locknuts).
        4) Emerson-OZ/Gedney-TC600I (compression type) Series (with locknut).
        5) Thomas & Betts-4240 (compression type) Series (90-degree angle with locknut).
        6) Emerson-OZ/Gedney-TWL (compression type) Series (90-degree angle with locknut).
    b. For EMT-to-EMT conduit-to-conduit coupling:
        1) Thomas & Betts-TK121A (set screw type) Series (with locknut).
        2) Emerson-OZ/Gedney-5000 (set screw type) Series (with locknut).
        3) Thomas & Betts-5120 (compression type) Series.
        4) Emerson-OZ/Gedney-TC600 (compression type) Series.
    c. For EMT to RMC conduit to conduit combination coupling:
        1) Thomas & Betts-HT221 (set screw type) Series.
        2) Emerson-OZ/Gedney-ESR (set screw type) Series.
        3) Thomas & Betts-530 (compression type) Series.
        4) Emerson-OZ/Gedney-ETR (compression type) Series.

D. Flexible Metal Conduit (FMC)
1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock between steel strips and provide raceway flexibility.
2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.
3. FMC shall be allowed for conduit size ranges from 0.5 inch through 4.0-inches.
4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.
5. FMC Fittings
    a. FMC fittings shall be malleable iron construction or steel construction.
    b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.

c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.

d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.

e. Direct FMC conduit-to-FMC conduit coupling of FMCs shall not be permitted.

f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); U.L. 514.

6. FMC fittings as manufactured by:

a. Straight Termination Connectors
Thomas & Betts-3110 Series
(with locknut)

45 and 90 Degree Angle Connectors
Thomas & Betts-3130 Series
(with locknut)

b. FMC to EMT conduit combination coupling:
Thomas & Betts 503TB Series.

E. Liquid Tight Flexible Metal Conduit (LTFMC)

1. The metal conduit core of LTFMC shall comply with the same Requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.

2. The exterior jacket shall be positively locked to the metal core to prevent jacket "sleeving".

3. The LTFMC shall be rated for installation and operating service temperatures of between minus 20 degrees centigrade through plus 90 degrees centigrade.

4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.

5. LTFMC sizes from 0.5-inch through 1.25-inch shall include an additional internal ground conductor, fabricated by the Manufacturer, as an integral part of the conduit core.

6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.

7. LTFMC shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.

8. In addition to the Requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).

9. LTFMC fittings

a. Fittings shall include an external mechanical ground/bond wire connector.

b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent "sleeving" of the jacket.

c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.

10. LTFMC fittings as manufactured by:
    a. Termination connector fittings:

	Straight	45 & 90 Degree Angle Connectors
1)	Thomas & Betts-5331 GR Series.	Thomas & Betts-5341GR & 5351GR Series.
2)	Appleton-STB & STN-L Series for use with preformed "knockouts".	Appleton-STB-L Series; STN-L Series for use with preformed "knockouts".
3)	Emerson- OZ/Gedney-4Q Series.	Emerson-OZ/Gedney-4Q Series

    b. LTFMC to RMC conduit to conduit combination coupling fittings:
        1) Thomas & Betts-5271 GR Series.
        2) Emerson-OZ/Gedney-4Q Series

F. Rigid Non-Metallic Conduit (RNMC)
    1. General
        a. Conduit and fittings shall be 90-degree centigrade conductor rated. Fabricated from homogeneous material, free from visible cracks, holes or foreign inclusions, with integral "end-bell". The conduit and conduit fittings shall be watertight and airtight.
        b. Conduit, conduit fittings and conduit fitting assembly "solvent cement" shall all be the product of the same Manufacturer. Conduit fittings shall be solvent cement welded watertight.
        c. Conduit and fittings shall be identified with legible markings showing ratings, size and Manufacturers name.
        d. RNMC and fitting shall be corrosion resistant, watertight.
        e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
        f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).
    2. Polyvinyl Chloride (PVC)-RNMC
        a. PVC-Schedule 40 heavy wall construction.
        b. PVC-Schedule 80 extra heavy wall construction.
        c. PVC-Type EB.
    3. RNMC fittings connecting to metallic raceways shall be provided with a ground/ bond jumper connection.

G. Combi-Duct
    1. Rigid nonmetallic conduit combining a continuous linear outer raceway (duct) with factory installed (inside the outer duct) multiple, segregated inner raceway (ducts). Rigid, Schedule 40 PVC construction, shall be modular lengths of 20-feet for each duct segment.
    2. The conduit shall be suitable for use with signal/telecommunications, fiber optic, telephone and computer/data circuits, operating at 100 volts or less, UL listed and labeled.

3. Outer Duct, outer enclosing Schedule-40 PVC duct size. The outer enclosing duct shall be 4.2-inches inside nominal duct diameter and 4.5-inches outer duct nominal diameter.
4. Inner-ducts (contained inside the enclosing outer duct), non-metallic SDR-19 or Type-C/ CAO-8546:

   Triple Combi-Duct

   a. Quantity of three continuous round rigid inner linear ducts, nominal size inside diameter 1.5-inch for each inner duct.

   Quad Combi-Duct

   b. Quantity of four continuous round rigid inner linear ducts, nominal size inside diameter 1.19-inch for each inner duct.
5. Manufacturer's standard bends and offsets, minimum 72-inches radius.
6. Combi-duct and combi-duct fittings shall be airtight and watertight. Approved for direct burial in earth and approved for encasement in concrete.
7. As manufactured by Carlon # Multi-Guard/Multi-Cell Series; American Pipe and Plastic (AMTEL) #Multi-Bore Series; or equal.

H. Expansion Joint, Deflection Joint and Seismic Joint Conduit Fittings

1. Expansion Conduit Fitting - Fitting shall provide for a minimum of 2-inches straight line movement between two connecting conduits in each direction (total 4-inches conduit expansion and Contraction) parallel to the respective conduit lengths. Fitting shall be watertight.
2. Deflection Conduit Fitting - Fitting shall provide for a minimum of 30 degrees angular deflection movement ("Shear" deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be watertight.
3. Combination Expansion/Deflection Conduit Fitting - Fitting shall provide the combined "expansion" and "deflection" movement capacity between two connecting conduits as described for separate "expansion" and "Deflection" conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.
4. Fittings shall comply with UL.
5. Fittings as manufactured by:
   a. Conduit expansion fittings exposed or concealed locations as manufactured by:
      1) Emerson-OZ/Gedney – AXB-8 Series for RMC conduit.
      2) Emerson-OZ/Gedney - TX Series for EMT conduit.
      3) Appleton – AXB or XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.
   b. Combination expansion/deflection conduit fittings exposed or concealed conduit locations as manufactured by:
      1) Emerson-OZ/Gedney - AXDX Series for RMC conduit.
      2) Emerson-OZ/Gedney - AXDX Series for EMT conduit.
      3) Appleton-DX Series for RMC conduit.

4) Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.

c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.
   1) Provide a minimum of 12-inches of "slack" LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.
   2) Note: Each FMC "slack" expansion/deflection location, shall be considered as not less than a 90-degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.

6. Conduit fitting bonding jumper:
   a. The grounding/bonding path of metal conduit shall be maintained by the fitting.
   b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.
   c. The jumper shall be a bare flexible copper "braid". The copper braid electrical current carrying capacity shall be equal to the metal conduit.
   d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connecting to each respective conduit end.
   e. The jumper braid length shall be 8-inches longer than the respective conduit fitting.
   f. Bonding jumper for FMC and EMT fittings as manufactured by:
      1) Emerson-OZ/Gedney – BJ and BJE Series
      2) Appleton – BJ/XJ Series

I. Conduit Bodies Conduit Fitting
   1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
   2. In-line form "C" conduit bodies shall be prohibited.
   3. The interior space "length" of 90 degree "elbow" conduit bodies shall not be less than six times the diameter size of the largest conduit connecting to the conduit body.
   4. Conduit body covers shall be removable, gasketed; watertight "domed" metal covers "Mogul-Type" with threaded screw attachment to the conduit body.
   5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire "pulling".
   6. Conduit body fittings shall comply with UL 514.
   7. Conduit bodies as manufactured by:
      a. For RMC Conduit
         1) Hubbell/Killark – LB/Mogul (90-degree elbow) Series – threaded body.
         2) Emerson-OZ/Gedney - LB 6X/Mogul (90-degree elbow) Series - threaded body.
         3) Appleton – NEC6X-LB/Mogul (90-degree elbow) Series - threaded body.
      b. For EMT Conduit
         1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.02 PVC COATING

A. PVC Coatings shall be provided as described for specified metal products.

B. PVC Coating shall be factory applied, to comply with NEMA-RN1 and 5-19.

C. The Adhesion of the PVC coating to the coated metal shall exceed the strength of the coating itself, based on 0.5-inch “strip-pull” test.

D. Uniform Coating Thickness shall be continuous without “breaks” or “pinholes” and shall not be less than the following:

1. Exterior metal surfaces, 40-millimeter coating thickness.
2. Interior metal surfaces, 10-millimeter PVC or urethane coating thickness (i.e. interior of conduits, interior of conduit fittings etc.).

2.03 CONDUIT SUPPORTS

A. General

1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.
2. Conduit supports, hangers and fasteners for PVC coated conduit shall be PVC coated to match the conduit PVC coating.
3. Threaded hardware shall be continuous, free running threads.
4. Conduit support systems, including support channels, pipe clamps, braces, anchors, hardware, fasteners, shall be sized to support the full capacity circuit conductors’ weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300% additional weight capacity safety factor.
5. Provide lock washer at each “bolted”/threaded connection.
6. Conduit supports, fasteners, channels, braces, hardware, anchors, pipe clamps, and hangers as manufactured by Unistrut or Kindorf.
7. Supports shall be free of “BURRS” and sharp edges.
8. Metal supports cut in the field shall be zinc galvanized after cutting to prevent rust.

B. Conduit Hangers

1. Threaded steel hanger rods.
   a. Hanger rods smaller than 0.375-inches in diameter shall not be used for support of individual conduits.
   b. Hanger rods smaller than 0.5-inches in diameter shall not be used for support of multiple conduits.
2. Conduit hanger wires shall be not less than 12-gauge steel.
3. Conduit hangers shall attach to structure fasteners with steel “Clevis” or “Swing” hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.
4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with “Clevis” type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.

C. Conduit Support Channels

1. "C" channels shall be factory preformed with a minimum 12-gauge thickness metal. The channel shall be factory "punched" with regularly spaced slotted holes for fastener attachments along the length of the channel.
2. The "C" channel shall not deflect more than 0.1 inch between channel supports at maximum installed design load, including required safety factor.
3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).
4. Channels shall provide "turned lips" at longitudinal edges to hold (lock-in) fasteners.
5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with treaded connections. Provide a minimum of two hangers (trapeze style) connected to each channel.
6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.

D. Fasteners, Seismic Earthquake Rated

1. Channel fasteners:
   a. Channel fasteners shall "pre-locate" and lock into the channel "turned lips" and channel "walls".
   b. A separate metal strap shall "tie" each conduit to each channel with conduit channel fasteners.
2. Structure fasteners:
   a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.
   b. Structure fasteners for wall and floor-mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.
   c. Structure fasteners shall center the support load above or below the beam flanges and reduce torsion-rotation forces exerted on the structural beam. Attach to steel structural members with "swing-beam clamps", with set-locking screw structure fasteners.
      1) Beam clamps shall include integral safety rod, strap or "J"-hook to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.
      2) Or double-ended beam clamp to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.
   d. Structure fasteners for wall and floor mounted conduit attachments shall attach to wood structural members with flush "through-bolted" wood beam/ wood framing stud structure fasteners.
   e. Structure fasteners for wall mounted conduit attachments shall attach to steel framing studs and steel structural elements with spot welded steel structure fasteners or drilled and bolted structure fasteners.

E. Brace Connectors

1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.
2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, non-suspended building “main” structural elements with fixed anchoring.
3. Brace attachment connectors and fasteners shall be rigid-performed steel channels or flexible #10-gauge steel hanger wire.
4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.04 ELECTRICAL POWER WIRE AND CABLE

A. General

1. All wire and cable shall be single-conductor, annealed copper, insulated 600-volt, #12AWG minimum unless specifically noted otherwise on the Drawings.
2. Conductors #10AWG and smaller shall be solid. Conductors #8AWG and larger shall be stranded.
3. Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90-degree centigrade rated insulation.
4. Insulation of conductors installed outdoors, on grade or underground, and insulation shall be rated for wet locations.
5. Insulation of conductors installed outdoors, installed exposed to the sun, installed in exposed conduits, insulation shall be rated for high-temperature 90 degrees centigrade.
6. Insulation of branch circuit conducts installed in light fixtures; insulation shall be rated for 90 degrees centigrade.
7. Conductor exposed to oil, insulation and jacket shall be oil resistant, complying with “Oil Resistant-1” and “Oil Resistant-2” UL 83.

B. Conductor Insulation

1. 600 Volt AC and/or DC insulated conductors installed entirely inside conduits, or enclosed inside wireways, or enclosed inside raceways, insulation shall be rated as follows.
    a. Indoor above Grade locations either concealed or exposed.
        1) Dual rated THHN and THWN
        2) Individually rated THHN-2
        3) Individually rated THWN-2
        4) XHHW-2
    b. Outdoor above Grade either concealed or exposed.
        1) XHHW-2
        2) THWN-2
        3) THW-2

c. Outdoor below Grade or outdoor on Grade.
   1) XHHW-2
   2) THWN-2
   3) THW-2

d. All other enclosed raceway locations not described above.
   1) XHHW-2
   2) THWN-2
   3) THW-2

2. Health Care facilities all circuits insulation shall be XHHW-2, rated Hospital-Grade.

3. 600 Volt AC and/or DC insulated conductors installed in open cable tray or open wireway or exposed insulation also shall be rated for exposed install locations.

C. Insulation Color Coding and Identification

1. The following color code for branch circuits:

   a. Neutral . . . White (Tape feeder neutrals with white tape near connections)

   b. Normal Power:

      120/208 Volt

Ground	Green
Phase A	Black
Phase B	Red
Phase C	Blue

   c. Isolated ground insulation shall be green with a longitudinal yellow stripe.

   d. Emergency power same insulation color as normal power except as follows:

      120/208 Volt

      Provide a continuous stripe on each conductor's insulation, orange or yellow, except ground

2. When individual neutral conductors are shown for each branch circuit, the color code for the neutral conductors shall be as follows:

   a. 120/208 volt; Phase A - White with Black stripe; Phase B - White with Red stripe; Phase C - White with Blue stripe.

3. Feeders identified as to phase or leg in each, switchboard, switchgear, panelboard and junction location with printed identifying tape.

4. Fire alarm conductors: Use 600-volt type THHN-2/THWN-2 conductors and color-coded per Equipment Manufacturer's recommendations and approved and listed for use on fire alarm systems by the State Fire Marshal.

5. Color coding for mechanical and plumbing control wiring shall be an agreed upon color code between the Mechanical/Plumbing Contractor and the Electrical Contractor, and color code shall be submitted to the District's Representative in writing for approval prior to installation.

D. Panel Feeders, Copper or Aluminum:

1. Wire size shown on the Drawings is for copper conductors, unless specifically indicated otherwise.

2. If aluminum wire is proposed, increase wire size to ampere capacity of copper wire and voltage drop not to exceed that of copper feeders indicated on Drawings. Increase conduit size and quantity as required by code. Provide feeder calculation sheet, eight copies, if aluminum wire is proposed, showing feeder number, length, size and voltage drop in percentage for original copper feeders and for equal aluminum feeders.
3. Aluminum Conductors (600-volt or Less Only): Contractor has the option of using aluminum conductors in lieu of copper conductors for feeders only to panels, distribution boards/panels, switchboards, switchgear, transformers, motor control centers, and dimmer switchboard.
4. Aluminum Conductors shall be Aluminum Association AA-8000 Series Alloy, compact-stranded, with the same insulation as called for under copper conductors.
   a. Aluminum conductor larger than 750 MCM shall not be used.
   b. Aluminum conductors smaller than #2AWG shall not be used.
5. If the conductor termination is to be made on a bus bar or similar flat surface, a Burndy Type YA-A HYPLUG compression terminal intended for the specific conductor size, factory filled with oxide inhibitor compound shall be used. Terminal must be installed using a hydraulic compression tool equipment with a die head for the particular terminal used. Only Burndy Hypress tools shall be used for compression.
6. If the conductor termination is to be made into a circuit breaker or similar insert compartment it shall be terminated by use of a Burndy AYP HYPLUG compression connector intended for the specific conductor size, factory filled with oxide inhibitor compound. Connector must be installed using only Burndy Hydraulic compression tool specifically approved for each respective connector.
7. Connector aid shall be used for all terminations and connections. Connector aid shall be Burndy Pentrox A, NO-OX-1D Grade “A”.
8. When an aluminum lug is terminated to a copper bus with a steel or copper stud or bolt, place aluminum lug on stud or bolt followed by a flat steel washer, a Belleville washer, and steel or copper nut, in that order.

2.05 CHEMICAL GROUND ROD

A. General

1. Self-contained ground rod(s) using chemically enhanced grounding shall be provided where specifically indicated on the Drawings. As manufactured by Lyncole XIT Grounding Systems, 22412 South Normandie Avenue, Torrance, CA. Telephone # (800) 962-2610; or Superior Grounding Systems, Irwindale, CA. Telephone # (800) 747-7925; or ERICO – Eritech Chemical Ground Electrode.
2. The ground rod shall operate from changes in atmospheric pressure pumping air through the ground rod, hygroscopically extracting moisture from the air to activate the ground electrolytic chemicals and improve the ground rod performance.
3. Ground rod system shall be UL-467 listed.
4. Ground rod system shall be 100% self-activating, sealed and maintenance free. The addition of chemical or water solutions shall not be required.

B. Ground Rod

1. Ground rod shall consist of a 2-inches nominal diameter hollow, copper tube. The tube shall be permanently capped on the top and bottom. Air breather holes shall be provided in the top of tube. Drainage holes shall be provided in the bottom and sides of the tube for electrolyte drainage into the surrounding soil.
2. The ground rod shall be chemically filled at the factory with environmentally non-hazardous water-soluble metallic salts to enhance electrical grounding performance.
3. Ground rod shall be a minimum of 10-feet long for straight (vertical) installation; or "L" shape minimum 20-feet long for horizontal installation.
4. Ground wire clamping "U-Bolt" with pressure plate on the top end of the tube sized for 1#2 through 500 MCM AWG ground electrode conductor connection and stranded 4/0AWG copper pigtail exothermically welded to the side of rod for ground electrode conductor connection.

C. Ground Box

1. Precast concrete box with slots for conduit entrances. Approximately 10-inch diameter by 12-inches high. Cast iron grate flush cover with "Breather" slots XIT Box #XB-12.

D. Backfill Material

1. Natural volcanic, non-corrosive Bentonite Clay backfill material.
2. Shall absorb water at a minimum of thirteen times its dry volume or approximately 14 gallons for 50 pounds of clay.
3. PH value 8-10 with maximum resistivity of 2.5 OHMS-M at 300% moisture content by weight.

2.06 FLEXIBLE CORDS AND PORTABLE CABLES

A. General

1. Multi-conductor insulated flexible cable with jacket rated extra heavy duty, extra hard-use and high abuse duty; ozone, sunlight, grease, oil resistant-UL 83 and water resistant; rated for indoor/outdoor use.
2. Quantity of conductors and conductor sizes as indicated on the Drawings but in no case less than five 16AWG.
3. Characteristics:
   a. Conductors - stranded copper, soft annealed conforming to ASTM-B-174 and ASTM-B-172. 600 volt individually insulated and color-coded. Separate green insulated ground conductor. Aluminum conductors shall not be permitted for cords and cables.
   b. Insulation - rubber conforming to UL 62; temperature range plus 105° Centigrade to minus 50° Centigrade.
   c. Flame resistance shall conform with MSHA-P123-103.
   d. Jacket - black for equipment connections and yellow for outlet connections. Rated for temperature range plus 105° Centigrade to minus 50° Centigrade, water, sunlight and ozone resistant. Permanently mark jacket a minimum of 40-inches on

center with rated voltage, Manufacturer's name, wire/insulation type, AWG conductor size and quantity (minimum 24-inches on center).

2.07 CABLE RACKS

A. Cable racks, installed on the vertical walls of the structure, including hooks and porcelain insulator cable cradles, shall be sufficient to accommodate the cables and splices.

B. Vertical racks shall be installed on all walls of the structure a minimum of 24-inches on center within 6-inches of floor and top of wall. A rack shall be installed within 18-inches of each corner of each wall. Additional racks spaced equally on each wall shall be installed; spacing between vertical wall racks shall not exceed 24-inches.

1. Wall racks shall be slotted to accept removable hooks and lock hooks into place.
2. Non-metallic, 50% (minimum) glass reinforced nylon or non-metallic material of the same characteristics.
3. The installed cable racks, cable support hooks with arms and wall anchor bolts shall support the following minimum loads for each hook/arm, with a 200% minimum safety factor. Based on multiple hook/arms located not less than 9-inches on center along the entire vertical length of the support rack:

	Hook/Arm Length	Min. Weight Each Hook/ Arm Supported	Max. Allowable Hook/ Arm Deflection
a.	8-inches	450 pounds	0.25-inch
b.	14-inches	350 pounds	0.37-inch
c.	20-inches	250 pounds	0.37-inch

(Based on load concentrated 1-inch from the end of each hook/arm.)

4. Racks shall be bolted to the precast and cast-in place structure walls, within 3-inches of each rack end and not less than 9-inches on center. Provide cast-in place or after-set drilled expansion concrete anchors.

PART 3 EXECUTION

3.01 TRENCHING, FOOTINGS, SLEEVES

A. Provide trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable Sections of this Specification.

B. Provide footings for all post and/or pole-mounted lighting fixtures: concrete shall conform to the applicable Sections of this Specification.

C. Sleeves

1. Provide sleeves for raceways, conduit and wire/cables passing through the following construction elements:
   a. Concrete and masonry foundations, floors, walls and slabs.
   b. Gypsum, Lath, and plaster walls and ceilings.
   c. Building structures (i.e., foundations, walls, floors, ceilings, beams, and roofs) with a fire rating exceeding 20-minutes.

2. Sleeves shall extend 1.5-inch above and below floors, except under floor standing electrical equipment. Sleeves shall be flush with wall ceiling foundations and partitions exposed to public view and extend approximately 0.5-inch past penetration in fire rated construction. Sleeves shall be installed at exact penetration locations and angles to accommodate wire/cable, raceway and conduit routings.
3. Joists, girders, beams, columns or reinforcing steel shall not be cut or weakened. Where construction necessitates the routing of conduit or raceways through structural members, framing or footings, written permission to make such installation shall first be obtained from the District's Representative. Such permission will not be granted, however, if any other method of installation is possible.
4. The layout and design of raceways and conduits located in or routed through masonry or reinforced beams or the District's Representative shall review walls before any work is performed. All sleeving shall be accomplished according to the instructions of the District's Representative and shall be accepted before any concrete is poured.
5. Sleeves, raceways and conduit shall be located to clear steel reinforcing bars in beams. Reinforcing bars in walls shall be offset to clear piping and sleeves.
6. Provide a continuous clearance between the inside of a sleeve and exterior of wire/ cables, conduits and raceways passing through the sleeve not less than the following:
    a. 0.5-inch clearance except as required otherwise.
    b. 1.0-inch clearance through outside walls below grade.
    c. 3.0-inch clearance through seismic joints.
7. Sleeves set in fire rated construction shall be caulked between sleeve and building structure, additionally sleeves shall be caulked between the sleeve and the wire/cables, conduits/raceways passing through the sleeve. The caulking shall be a fireproof sealant, equal to the fire rating and temperature being penetrated. Clearance between components inside of sleeve and exterior of components passing through sleeve and between components inside sleeve shall comply with Fireproof Sealant Manufacturer's recommendations.
8. Sleeve material:
    a. In floor construction: Schedule 40 black steel pipes, with upper surface to be sealed watertight.
    b. In concrete or masonry walls roofs or ceilings: Schedule 40 black steel pipes. When installed in roofs or outside walls, seal outer surface watertight.
    c. In fire rated construction; 24-gauge galvanized iron or steel.
    d. Sleeves through waterproof membranes: Cast iron or Schedule 40 steel with flashing clamp device and corrosion resistant clamping bolts. Caulk space between pipe and sleeve and surfaces between sleeve and conduits sealed watertight.

3.02 GROUNDING

A. Grounding shall be executed in accordance with all Applicable Codes and Regulations, both of the State and Local Authorities Having Jurisdiction.

B. Where non-metallic conduit is used in the distribution system, the Contractor shall install the proper sized copper ground wire in the conduit with the feeder for use as equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.

C. The maximum ground/bond resistance to the grounding electrode shall not exceed 1 ohm from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5 ohms.

D. Ground/Bond Conductors

1. Provide additional, dedicated, green insulation equipment ground/bond wire inside each conduit type and raceway as follows. Size the ground/bond conductors to comply with CEC/NEC Requirements. The metal conduit or raceway shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:
   a. All types of nonmetallic conduit and all types of non-metallic raceways including but not limited to: RNMC - Rigid Nonmetallic Conduit.
   b. FMC - Flexible Metal Conduit.
   c. LTFMC - Liquid Tight Flexible Metal Conduit.
   d. Metal and non-metal raceways.
   e. RMC - Rigid Metal Conduit.
   f. EMT - Electrical Metal Tubing.
2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:
   a. Every conduit and raceway path containing any length of the above identified conduits or raceway.
   b. Every conduit path and raceway path connected to any length of the above-identified conduits and raceways.
3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the Drawings. Install equipment ground/bond wire in each conduit/ raceway, with the respective phase conductors:
   a.

Feeder, Subfeeders & Branch Circuit Protection	Min. Equip. Grnd Wire Size
15 amp	#12
20 amp	#12
30 to 60 amp	#10
70 to 100 amp	#8
101 to 200 amp	#6
201 to 400 amp	#2
401 to 600 amp	#1
801 to 1000 amp	2/0
1001 to 1200 amp	3/0
1201 to 1600 amp	4/0
1601 to 2000 amp	250 MCM
2001 to 2500 amp	350 MCM
2501 to 4000 amp	500 MCM

4. Isolated grounds - Raceways containing branch circuit or feeder phase conductors connected to panelboards equipment, or receptacles with isolated grounds or isolated ground bus shall contain a dedicated insulated ground conductor connected to the isolated ground system only. The isolated ground conductor shall be continuous the length of the raceways and connected only to the isolated ground terminals in addition to and independent of the equipment bonding/ground conductor. The isolated ground conductor shall be sized as indicated above, for equipment ground/bond wire.
5. Splices in ground/bond wires shall be permitted only at the following locations:
   a. Ground buses with listed and approved ground lugs.
   b. Where exothermic welded ground/bond wire splices are provided.
6. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.

E. Where conductors are run in parallel in multiple raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.

F. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.

G. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

H. UFER Ground
1. In addition to all cold water and structural steel grounds provided to meet this Specification, there shall be a main ground system of the UFER ground style.
2. The UFER ground electrodes shall be a minimum of two 20-feet lengths of #4/0 AWG bare stranded copper cable embedded horizontally in the cast in place concrete footing, extending in opposite directions in the footings. All portions of the ground electrodes shall be placed inside the concrete, between 2-inches and 4-inches from the earth surrounding the concrete.
3. The lengths of cable shall extend in opposite directions in the footings, with the center end of each cable terminated onto the main electrical service ground bus for the main electrical service equipment.
4. All wire cable connection terminations onto the ground bus shall be exothermic weld type.
5. The “UFER” grounding electrode, embedded in concrete, shall be exothermically welded to each steel reinforcing bar (rebar) and each steel anchor bolt located within 18-inches of the grounding electrode inside the concrete. Note: Reinforcing steel (rebar), in concrete foundations, attached with metal “tie-wraps” and in direct physical contact to other adjacent rebar that is in turn exothermic welded to the UFER grounding electrode,

may be classified as attached to the UFER grounding electrode, and does not require additional exothermic weld connections to the UFER grounding electrode.

I. Provide a separate ground/bond insulated grounding electrode conductor, copper wire from the main electrical service ground bus to each of the following locations. The ground/bond conductor shall be sized to comply with applicable Codes and as indicated on the Drawings, but in no case smaller than the following:

1. Main service entrance equipment ground bus:
    a. Services smaller than 1200 amp 1.5-inch conduit with 1#4/0.
    b. Services 1200 amp and larger 2.5-inches conduit with 1#500MCM.
    c. Where a separate ground bus is not required, connect ground to electrical equipment metal housing
2. Each telephone backboard and signal system backboard location, 1.25-inch conduit with 1#1.
3. Metal cold water pipe located inside the building, 1.5-inch conduit with 1#4/0.
4. Outdoor underground metal cold water pipe, make connection five feet from the building, 1.5-inch conduit with 1#4/0.
5. Each service entrance ground bus and each separately derived ground rod system:
    a. Services smaller than 1200 amp 1.5-inch conduit with 1#4/0.
    b. Services 1200 amp and larger 2.5-inches conduit with 1#500MCM.
6. Separate 1.25-inch conduit with 1#2 (AWG) bonding conductor to each interior metal pipe system located in the same building, including but not limited to, the following:
    a. Fire sprinkler system each stand pipe location (water based and non-water based).
    b. HVAC chilled water supply and return, at each pump location.
    c. Roof drains.
    d. Waste liquid disposal systems.
    e. Metal gas pipe service entrance and service meters.
    f. Hydraulic elevator hydraulic pipes.

3.03 CONDUIT

A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the Drawings, but not less than the conduit size required by Code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed below floors and concealed above ceilings, except as specifically noted otherwise.
    a. Conduits shall not be installed in concrete floors.
3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100-volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.

4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete and operating conductor/wire raceway system.
5. Metal and non-metal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
6. Individual conduit paths and home runs shown on the Drawings shall be maintained as separate individual conduits for each homerun and path.
7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable code Class 1 Division 1 Requirements, unless specifically noted otherwise.
8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes, and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.
9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with "concentric ring" knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/bonding lug integrated with the conduit termination conductor fitting construction, by the Fitting Manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
10. The type of conduit, type of conduit fittings, and type of conduit supports, and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the Manufacturer's recommendations; based on the applicable Codes and based on the Requirements of the Contract Documents.

B. RMC Installation Locations

RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Embedded in floors, walls, ceilings, roofs, foundations, and footings constructed with concrete.
2. Embedded in walls and foundations constructed with brick and masonry.
3. Interior of buildings, within 9-feet of finish floor lines for exposed conduit locations.
4. Exterior of building for exposed conduit locations.
5. Damp or wet locations exposed or concealed locations.
6. Exposed on roofs.
7. In hazardous materials areas and locations; below hazardous materials areas and locations; above hazardous materials areas and locations.
8. Exposed on utility service poles, for pole risers less than 9-feet above finish grade.
9. RMC conduit and RMC fittings may be installed in any location where EMT and FMC conduit is permitted to be installed.

C. PVC Coated RMC Installation Locations

PVC coated RMC conduit and PVC coated RMC fittings shall be installed in the following locations:

1. Underground conduit locations for elbows and bends with a radius of less than 36-times the conduit diameter.
2. Underground vertical risers extending above grade.
3. Entire length of underground conduits for the following circuits:
   a. Audio microphones
   b. Lighting dimming controls
4. Installed in contact with earth or corrosive materials.
5. Exposed in “cold” rooms and “refrigerated” rooms, rooms with a maintained temperature below 65 degrees Fahrenheit.

D. EMT Installation Locations

EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry locations:

1. Concealed in hollow non masonry/non-concrete, metal stud frame and wood stud frame walls and floors.
2. Concealed above ceilings.
3. Exposed inside interior enclosed crawl spaces.
4. Exposed interior locations placed 9-feet or higher above finished floors (except as described in paragraph below at lower heights).
5. Exposed on walls and ceilings (any height) in the following dedicated function areas, interior enclosed room locations:
   a. Indoor enclosed electrical equipment rooms and closets.
   b. Indoor enclosed data and telecommunication terminal rooms and closets.
   c. Indoor enclosed HVAC equipment rooms and closets.
6. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.

E. FMC Installation Locations

FMC conduit and FMC fittings may be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry, interior locations:

1. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
2. Concealed above fully enclosed ceiling spaces.
3. FMC conduit shall be installed in continuous lengths between termination points. FMC shall not be “spliced” or coupled directly to FMC or any other conduit type under any circumstance.

4. The maximum continuous length of FMC that shall be installed between termination end points is 15-feet. Circuits requiring continuous conduit lengths exceeding 15-feet between termination end points shall be installed using either RMC or EMT conduits. FMC lengths shorter than 16-inches are prohibited.
5. The minimum size FMC conduit shall be as shown on the Drawings but not be less than the following:
    a. FMC lengths of 6-feet or less, minimum FMC conduit size shall be 0.50-inch.
    b. FMC lengths exceeding 6-feet, minimum FMC conduit size shall be 1.0-inch.

F. LTFMC Installation Locations

LTFMC conduit and LTFMC fittings shall be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials":

1. Final electrical connection to vibrating or rotating equipment; control and monitoring devices mounted on vibrating and rotating equipment including the following. Minimum conduit length shall not be less than 24-inches:
    a. Motor, engines, boilers, solenoids, and valves.
    b. Fixed mounted "shop" (manufacturing) production equipment.
    c. Fixed mounted food preparation equipment and "kitchen" equipment.
2. All locations where exposed flexible conduit connections are required, both indoor and outdoor.
3. Final connection to indoors electrical transformers. Minimum conduit length shall not be less than 24-inches; maximum conduit length shall not exceed 72-inches.
4. Do not install LTFMC located in environmental air plenums.

G. RNMC Installation Locations

RNMC conduit and RNMC fittings shall be installed in the following locations containing only "non-hazardous material":

1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
2. Exposed on utility service poles, for pole risers at 9-feet or higher above finish grade, Schedule 80 PVC only.
3. RNMC type "EB" conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.
4. Non-metal type raceways and RNMC type conduit shall not be installed inside buildings.

H. Combi-Duct Installation Locations

Combi-duct conduits shall be installed where shown on the Drawings. Combi-duct shall be installed underground (below grade) as follows:

1. Do not install exposed or inside buildings above grade.
2. Provide a 0.25-inch pull rope in each inner duct.
3. Radius and elbows shall be rigid non-metallic, PVC, Manufacturer factory fabricated, in lieu of PVC coated RMC conduit.

4. Inner ducts shall be supported by internal spacers inside the enclosing outer duct.
5. Provide end bell and three hole "snug-plugs" at each entrance end of Combi-duct into pullboxes, manholes, equipment cabinets stubups and Combi-duct terminations. Compression type “snug-plugs” shall provide watertight and airtight seal between inner and outer ducts and around future cables installed in inner duct.

I. Conduit Installation

1. Conduit Supports
   a. Securely and rigidly support all raceways/conduits from the building structure. Raceways/Conduits shall be supported independent of all piping, air ducts, equipment ceiling hanger wires, and suspended ceiling grid systems. Secure conduit to structural element by means of UL listed and approved hangers, fasteners, “C” Channels and pipe clamps.
   b. Provide conduit supports spaced along the length of the conduit as follows:
      1) RMC and EMT conduit, maximum not to exceed 96-inches on center; within 24-inches of each conduit bend and conduit termination location.
      2) FMC and LTFMC conduit, maximum not to exceed 24-inches on center; within 6-inches of each conduit bend and conduit termination location.
   c. Suspended conduit methods:
      1) Individual, suspended raceways/conduits separated by more than 12-inches from any other conduit and suspended from ceilings and roofs shall be supported as follows:
         a) Conduits smaller than 1.5-inches by means of hanger rods or hanger wires.
         b) Conduits 1.5-inches and larger by means of hanger rods.
         c) The conduit shall attach to the hangers with pipe clamps.
      2) Suspended raceways/conduits positioned within 24 inches of any other conduit shall be grouped and supported by hanger rods using trapeze type conduit support channels ("C" Channels). Conduits shall individually attach to common channels side-by-side, with pipe clamps.
   d. Non-suspended conduit methods:
      1) Individual raceway/conduits placed against wall/ceiling/floors, placed inside hollow wall/ceiling construction or structure framing (i.e., “dry- wall” or plaster hollow wall construction), shall be secured by means of individual pipe clamps and fasteners attached to the framing studs or other structural members and the conduit/raceway.
      2) Provide common “C" channel supports for all multiple raceway/ conduits placed against vertical or horizontal surfaces and positioned within 24-inches of other raceways/conduits. Attach channels to the framing studs or other structural members. Attach the conduits/raceway individually to common channels, side-by-side, with pipe clamps.
      3) The use of toggle bolts is prohibited.
   e. Conduit rising from floor for motor connection shall be independently supported if extending over 18-inch above floor. Support shall not be to a motor or ductwork, which may transmit vibrations.

f. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Seismic Zone Requirements. The conduit support/anchoring system capacity shall include the weight of the conduits, conduit fittings, conduit supports and conductors/wires/cables installed in the conduits plus a 300% safety factor. Submit Shop-Drawing details showing each typical conduit anchor, conduit support and conduit brace location. Submit structural calculations performed by and signed by a Professional Structural Engineer (P.E.) with a P.E. License, Registered in the State of California, U.S.A.

2. Conduit separation:
   a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e. signal to signal, data to data, power to power, control to control etc.) by a minimum of 3-inches. Conduits of non-identical systems (i.e. signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12-inches.
   b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2-inches; conduits for non-power systems (100 volts and less to ground) shall be separated by a minimum of 6-inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3-inches.
   c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60-inches of the termination or crossing points.
   d. Conduits containing Utility Company service circuits (i.e. electrical power, telephone, or cable television) shall be separated a minimum of 12-inches from all other utilities and conduits, with or without concrete encasement, metallic or non-metallic conduit, above grade or underground conduit locations.
   e. Conduits shall be separated from hot water piping, exhaust flues/ chimneys, steam piping, boilers, furnaces, ovens by a minimum of 12-inches.
3. Conduit stubs:
   a. Branch circuit and telephone conduits turned up from floor at the following locations shall terminate each conduit in a flush conduit coupling at the floor and then extend into partition or to equipment. Refer to District's Representative's Drawings for location of walls and partitions.
      1) Interior demountable partitions.
      2) Below, into or adjacent to equipment not installed directly adjoining to a wall.
      3) Up from below the floor into hollow stud frame walls.
   b. From each panel, and signal cabinet which is wall mounted, stub up from top of the panel/cabinet a minimum of three 1-inch conduits to the nearest accessible ceiling spaces or other accessible location. Where the floor below the panel is accessible or is a ceiling space, stub an additional three 1-inch conduits from the bottom of the panel into the accessible space below the panel. Cap conduits for future use.
   c. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of five feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stubout conduit shall be capped.

Provide concrete monuments, 6-inches by 6-inches by 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inch square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).

d. Conduits stubbed into ceiling or floor spaces from outlets for telephone, video, computer/data or television shall be provided with an insulated throat bushing, on the end of each conduit stubout.

e. Conduit stubouts from outlet boxes and equipment located in hollow stud walls, into ceiling and floor spaces, shall be EMT or RMC conduit. The stubouts shall terminate into the ceiling and floor spaces with a conduit termination connector fitting.

f. Empty conduit stubs into building spaces and equipment shall be individually identified with an “ID-tag” located at each end of the conduit. The ID-tag shall state the origination point and termination point of the respective conduit (i.e., “from PNL-A/to Room #121”; “from outlet #24/to outlet #17 in Room #120”; etc.).

g. Provide a conduit termination fitting with insulated throat bushing and mechanical ground lugs at each conduit “stub-up” location.

4. Conduit concrete encasement:

a. Conduits which are run underground exterior to building slab shall be continuously concrete encased except, 15 and 20-amp power branch circuit conduits underground do not require concrete encasement.

b. PVC rigid-non-metallic-type EB conduit, of any size and any location shall be continuously concrete encased the full length of the conduit installation, including under building slab.

c. Concrete for encasement of underground conduits shall be 2000-PSI 28-days cure strength with a mix of cement, sand, water and maximum of ¾-inch gravel. Concrete encasement of conduits shall be continuous without voids. The encasement shall extend 3-inches past the edges of all conduits on all sides of the circuit. Provide 10-pounds of red oxide cement coloring uniformly mixed with each cubic yard of concrete for conduit encasement.

d. Conduits located below or adjacent to structural foundations shall be separated from the foundation by a minimum of 12-inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottom of the foundation to the bottom of the conduits. The concrete shall be 4000 PSI 28-day cure strength instead of 2000-PSI concrete.

e. Conduits of any size and type (including 15 amp and 20-amp power branch circuits) located under roads, paved areas and “transit-system” right of way shall be concrete encased.

5. Underground conduits:

a. Three or more underground conduits larger than 1-inch in size and occupying the same trench shall be separated and supported on factory fabricated, non-metallic, duct/conduit support spacers. The spacers shall be modular, keyed interlocking type, "built-up" to accommodate quantity, size orientation and spacing of installed conduits.

The spacers shall maintain a constant distance between adjacent conduit supports and hold conduits in place during trench backfill operations. Minimum support spacer installation interval along with length of the conduits shall be as follows:

1) Concrete encased conduits, not less than 8-feet on center.
2) Non-concrete encased conduits, not less than 5-feet on center.

b. Provide trenching, excavation, shoring and Backfilling required for the proper installation of underground conduits. Tops of backfill shall match finish grade.

c. Bottoms of trenches shall be cut parallel to "finish grade" elevation. Make trenches 12-inches wider than the greatest diameter of the conduit.

d. Back-filling Trenches for Conduits without Concrete Encasement Requirements
   1) Conduits which are not required by the Contract Documents to be concrete encased and are located exterior to building slab, shall be set on a 3-inch bed of damp clean sand. Conduit trenches shall be backfilled to within 12-inches of finished grade with damp sand after installation of conduit is completed. Remainder of backfill shall be native soil.
   2) Conduits located under a building which are not required by the Contract Documents to be concrete encased, shall be completely backfilled and compacted with clean damp sand to the same level as the building foundation pad.
   3) Provide a continuous yellow 12-inches wide flat plastic tracer tape, located 12-inches above the conduits in the trench. The tracer tape shall be imprinted with "Warning-Electric Circuits" a minimum of 24-inches on center.

e. Backfilling trenches for conduits under paved areas:
   1) In addition to the Requirements of conduit concrete encasement, conduits under walkways, roads, parking lots, driveways, and buildings shall be cast in place concrete "slurry mix" backfill. The slurry mix shall cover each side and top of conduits and conduit concrete encasement. The slurry mix shall be continuous to the underside of the finish subgrade surface.

f. Backfilling trenches for conduits with concrete encasement Requirements by the Contract Documents:
   1) Trenches with all conduits concrete encased shall be backfilled with clean damp sand when located under building pads.
   2) Trenches with all conduits concrete encased and not located under a building pad and not located under paved areas shall be backfilled with clean damp sand or native soil.

g. Backfill material:
   1) Sand and native soil backfill of trenches shall be machine vibrated in 6-inch lifts to provide not less than 90% compaction of backfill.
   2) Soil backfill shall have no stones, organic matter of aggregate greater than 3-inches.
   3) Concrete and slurry mix (2000-PSI) shall be machine vibrated during installation to remove "air-voids".
   4) The slurry mix shall consist of concrete, clean rock, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.

h. Do not backfill until District's Representative has approved Installation and As-built Drawings are up to date. Promptly install conduits after excavation has been done, to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.

i. Install underground conduit, except under buildings, not less than 24-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.

j. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72-inches and the specified separation and depths are maintained when crossing over the top of the existing underground utility, the conduit may cross above the existing underground utility.

k. Provide long radius horizontal bends (minimum radius of 36-times the conduit diameter) in underground conduits where the conduit is in excess of 100-feet long.

l. Conduits installed below grade and on grade below buildings, shall not be smaller than 0.75-inches. Conduits for circuits exceeding 600-volts shall not be smaller than 5.0-inches.

m. Underground conduits entering a building shall be sloped. The conduit direction of slope shall be away from the building and shall prevent water in the conduit from "gravity draining" towards the building. The conduit slope "high point" shall originate from the building, out to the first exterior pullbox, manhole etc. exterior conduit termination "low point". The minimum slope angle shall be a constant 8-inches (or greater) of fall for each 100-feet of conduit length.

n. Dewatering:

1) Provide pumping to remove, maintain and dispose of all water entering the excavation during the time the excavation is being prepared, for the conduit laying, during the laying of the conduit, and until the backfill at the conduit zone has been completed. These provisions shall apply on a continuous basis. Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the construction. Groundwater shall not be allowed to rise around the pipe until joining compound has firmly set.

2) The District's Representative shall be notified 48 hours prior to commencement of dewatering.

6. Raceway/Conduits, which are installed at this time and left empty for future use, shall have 0.25-inch diameter polyvinyl rope left in place for future use. The pull rope shall be 500-pound minimum tensile strength. Provide a minimum of 5-feet of slack at each end of pull ropes.

7. Unless otherwise restricted by Structural Drawings and Specifications, the maximum size conduit permitted in concrete slab on-grade, walls, ceilings and roofs constructed of masonry or concrete shall not be greater than 20% of the concrete/masonry thickness. Conduits installed in these locations shall not cross.

a. Conduits shall not be installed in cast-in-place concrete floors.

8. Provide openings in building structures for conduit penetrations:
    a. New construction shall be provided with conduit sleeves, to provide conduit penetrations.
    b. Existing construction shall be drilled (core drill masonry and concrete) and provide conduit sleeves installed after drilling, to provide conduit penetrations.
    c. Where the structure penetrations for underground conduits penetrating through foundations will not comply with the (restriction/penetration) shown in the Contract Documents, install the conduits below and clear of the foundation lowest point.
9. Conduit bends risers and offsets:
    a. The minimum bend radius of "factory or field" fabricated conduit bends shall not be less than the following. The bend radius shall be measured at the surface, inside radius of the conduit wall:
        1) FMC and LTFMC conduit - conduit minimum bend radius 12-times the conduit diameter.
        2) RMC and EMT conduit minimum bend radius - conduit for power circuits over 100 volts and less than 600 volts, 8-times conduit diameter. Conduit for power circuits over 600 volt, 12-times conduit diameter. Conduit for low voltage, signal and fiber optic circuits, 10-times conduit diameter.
        3) RNMC conduit - conduit minimum bend radius 36-times the conduit diameter. Under building reduce minimum bend radius to 10-times the conduit diameter. Conduit bends and offsets in RNMC with less than 36-times conduit diameter bend/offset radius, shall be RNMC PVC schedule 80 or PVC coated RGS.
        4) Conduits for Utility Company conductors. Conduit minimum bend radius shall comply with the respective Utility Company Requirements.
    b. Bends and offsets in conduits shall be kept to an absolute minimum. The total summation of all bends and offsets permitted in a conduit segment, occurring between two conduit termination/connection end points, shall not exceed the following, including conduit fittings:
        1) RMC and EMT conduit - 360 angular degrees
        2) FMC and LTFMC conduit - 180 angular degrees
        3) RNMC conduit - 270 angular degrees
    c. Each field fabricated conduit offset, bend and elbow, which are not the standard product of the Raceway/Conduit Manufacturer shall be mandrel tested. The test shall be conducted after the conduit installation is complete and prior to pulling-in any wire, in the same manner as for underground conduits.
    d. Factory manufactured angle connector conduit fittings shall be installed in exposed conduit locations only. Installation in locations normally concealed from view shall not be permitted. Not more than one factory manufactured angle connector shall be permitted in any length of conduit between conduit termination end points.
    e. RNMC conduit risers from below grade shall be PVC coated RGS. Conduit risers, bends or offsets entering into a building shall be PVC coated RGS.

f. If three or more conduit-bends of the same conduit size and same conduit material type, installed, as part of the Contract Work, fail to comply with the required minimum conduit bend radius or conduit angular degree limits. The following corrective actions shall occur:
   1) The Contractor shall remove all the non-complying conduit bends and the respective wire in the conduit from the project site. Provide new conduit and wire, complying with the Contract Documents.
   2) Where the conduit bends similar to the non-complying conduit bends are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the conduit bends to allow visual observation.
   3) The Contractor shall remove the non-complying conduit bends and dispose of the Project Site. The Contractor shall provide new conduit bends and conductors complying with the Contract Documents.
   4) All the costs to correct the deficient material and work along with costs to repair the direct, indirect, incidental damages and Contract delays shall be the sole responsibility of the Contractor and shall be included in the bid price.

10. Expansion joint, deflection joint and seismic joint fittings.
    a. Provide a conduit expansion fitting for each conduit length and conduit type as follows (Note - The installation of specified combination expansion/deflection fittings at seismic joints shall satisfy this spacing Requirement also):

	Conduit Type	Conduit	Fitting Length Spacing
1)	RMC and EMT	Exposed exterior locations	200-feet
2)	RMC and EMT	Interior weather protected locations	400 feet

    b. Provide a conduit combination expansion/deflection fitting for each conduit, crossing the following elements:
       1) At each building or non-building structure seismic joint.
       2) At each building on non-building structure expansion joint.
       3) At each conduit penetration of a “sound-rated” wall, floor or ceiling.
11. Provide two locknuts and an insulated throat bushing at each metal conduit terminating at enclosures, including but not limited to outlet boxes, junction boxes, terminal cabinets, switchgear, transformers, switchboards, distribution panels and panelboards.
12. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.
13. Conduit run exposed, shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds, OZ or equal. Conduits run on exposed beams or trelliswork shall be painted to match surrounding surfaces.
14. Conduit exposed on roof:
    a. Conduits installed exposed on roofs shall be installed on conduit sleepers. Place the conduit sleepers a maximum 5-foot on center along the entire length of the conduit; under conduit expansion/deflection fittings; under each junction box and within 24-inches of each conduit bend.
    b. Provide a conduit support “C” Channel continuous along the top length of the sleeper and rigidly bolted to the sleeper. Conduits shall be loosely fastened to each

sleeper “C” Channel with pipe clamps to allow for relative movement between the sleeper and conduit.

c. Conduits shall not block or interfere with roof hatches, doors, ventilation openings, dampers, equipment access panels/doors, roof water drainage.

e. Conduit sleepers shall be fabricated from “clear” solid redwood 4-inches by 4-inches (nominal) size. Sleeper length shall extend a minimum of 9-inches past the conduits attached to the sleeper, but in no case shall the length of the sleeper be less than 24-inches.

f. Provide a pad under each sleeper; sleepers shall not be installed in direct contact with the roofing. Sleeper pads shall extend a minimum of 6 inches past each side of the sleeper. The sleeper pad shall be semi-rigid mineral surfaced composition board, not less than 0.375-inch thickness, bituminous impregnated, manufactured for application on the specific roofing material. Remove roofing “ballast” (gravel) under pad, prior to installation of sleeper pad. Do not puncture roof membrane.

g. Position the “length” of the conduit sleepers’ perpendicular to the roof slope, to prevent obstruction of roof drainage water flow. Where the conduit routing prevents placing the conduit sleeper parallel to the roof slope, provide two separate sleeper pads for the conduit sleeper, with a continuous 3-inches wide water drainage gap between the sleepers. Align the water drainage gap to allow unimpeded water travel along the roof slope drainage flow line between the pads.

h. Sleepers and sleeper pads shall be set in nonhardening mastic, a minimum of 0.25-inch thickness. Mastic shall be inorganic, nonhardening, and complying with ASTM-D1227. Mastic shall be applied with continuous uniform coverage, minimum 0.25-inch thickness, on all the surfaces of each conduit sleeper and on the sleeper pad contact surface with the roof.

15. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.

16. RMC conduit threads:

    a. Machine cut threads on RMC conduit required for field fabrication shall comply with NPS and ANSI-B1.20.1.

    b. The length of bare metal exposed during thread fabrication shall be completely covered by conduit couplings and fittings. Additionally, the thread length shall insure that conduit joints will reach “torque” tightness and become secure before conduit ends “butt” together and before conduit ends “butt” into the “shoulders” of other conduit fittings.

    c. Running threads or right/left-handed threads shall not be used to connect RMC.

17. RNMC conduit:

    a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.

18. Tighten each conduit fittings and fitting appurtenance, to the "torque" (allowable tolerance ±5%) value recommended by the Fitting Manufacturer and applicable code. If three or more conduit fittings are found to not be in compliance with the Manufacturer's "torque" (tightness) recommendations, the following corrective actions shall occur:
    a. The Contractor shall tighten "re-torque" the defective fittings and all similar conduit fittings installed as part of the Contract Documents in the presence of the District's Representative.
    b. If the respective conduit fittings similar to the deficient "torque tightness" fittings are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the fitting, to allow retightening each similar conduit fitting to the Manufacturers recommended "torque" values.
    c. All the cost to repair the direct, indirect, incidental damages and Contract delays resulting from complying with these Requirements shall be the sole responsibility of the Contractor and shall be included in the bid price.
19. Horizontal directional boring for underground conduit:
    a. Provide a directional guided horizontal "bore-hole" underground conduit installation where one or more of the following conduits occur:
        1) Continuous trenching excavation and backfill for conduit installation is not permitted by the Contract.
        2) Where continuous trenching excavation due to the existing surface and below grade conditions and restrictions, is not possible or practical to excavate a trench.
    b. Provide "path-tracing" of the underground bore head, from the surface, along the entire horizontal bore length. Path tracing shall use electronic transmitters and receivers, continuously communicating the underground bore head locations and depth to the bore equipment operator. The directional boring system shall employ active tracking and directional position/steering control of the bore equipment drill head location. The active tracking system shall provide a portable receiver/ transmitter unit for tracking the position of the moving drill head; a sensor "Sonde" unit on the drill head for tracking signals to the receiver/transmitter; and a drill head tracking data view display located at the boring equipment operator position to view the drill head position information sent from the portable receiver/transmitter. As manufactured by SPX-Radiodetection Company or similar products.
    c. Provide vertical pilot excavations not more than 50-feet on center along the path of the bore-hole to intercept the horizontal bore-hole routing, provide excavations at the beginning and end terminals staging points of the horizontal bore-hole.
    d. Provide full-depth "shoring" of the vertical pilot excavations. Remove the shoring, backfill, compact and repair the excavations when conduit installation is complete.
    e. "Drilling-fluid" shall be used during "back-reaming" and "pullback", pumped through the drill pipe to the bore drill head.
    f. Directional guided horizontal drilling shall employ equipment specifically designed and manufactured for the process. The Equipment Manufacturer shall train bore equipment operating personal in the proper operation of said equipment.
    g. Locate the position, size, depth and identify all underground "cross-bore" existing underground utilities, pipes, structures and conflicts along the entire bore path of

each underground bore, prior to initiating directional boring work. Notify respective agency for each "cross bore" potential crossing. Comply with the recommendations of the Cross Bore Safety Association (CBSA).

h. Horizontal, directionally guided boring equipment, as manufactured by Ditch Witch; Vermeer Manufacturing; or Case Corporation.

J. Conduit Seals

1. Provide conduit seal fittings at each location where a conduit transitions or passes through the following areas and where indicated on the Drawings:
   a. Refrigerated areas.
   b. Temperature control rooms including warming rooms, steam rooms, saunas etc.
   c. Classified hazardous material areas.
   d. Water intrusion areas.
2. Provide conduit seals on each conduit entering a building from a below grade area located outside the building (i.e., basement, vault etc.) and connecting to the following types of equipment
   a. Transformers
   b. Panelboards
   c. Motor control centers
   d. Switchboards
   e. Switchgear
   f. Motors
   g. Terminal cabinets
   h. Terminal backboards
   i. Cable trenches
3. Conduit seals shall be installed in locations where the fitting is visible and accessible.

K. Nailing Shields

1. Provide "nail" shields where FMC conduit and conductors not installed in a conduit are installed through wood stud and wood frame construction. The nail shield shall provide a barrier resistant to "nailing" fasteners through the stud and penetrating into the FMC and conductors.
2. The nail shields shall be flat nominal 1.5-inch by 3-inches, 14-gauge steel, and hot dip zinc galvanized with "nailing spurs".
3. Provide nailing shields on the front face and rear face of each FMC penetration. The shield shall be centered on each penetration through the respective framing, stud framing blocking, and stud framing plates.

L. Conduit Bodies

1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.
2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
3. Conduit bodies shall not be installed inside enclosed walls.

M. Preparation of Reuse of Existing Conduits

1. Prepare existing conduits shown to be reused as part of Contract Work as follows: Complete the required work prior to installing any conductors or cables in respective existing conduits.
    a. "Rod" out existing raceways to be used under this contact, with approved test and flexible mandrels to remove all obstructions to clear debris from inside conduits.
    b. Use test mandrels at least 12-inches long, 0.25-inch less than diameter of duct at center, tapering to 0.5-inch less than duct size at ends.
2. If test mandrels cannot be pulled through raceways, Contractor shall perform the following to clear the existing raceways:
    a. Force rigid or semi-rigid rods through the raceways to clear the obstructions from one to both ends of the raceway.
    b. Force a power-driven rotating router device through the conduit from one or both ends of raceways. Device shall incorporate small diameter cutting blades. Repeat the "router" process in incremental stages to a cutting blade diameter approximately ⅛-inch smaller than the raceway inside diameter.
3. After clearing the raceway of obstructions, pull a test mandrel or brush through the raceway to clear the remaining debris from the raceway.

3.04 WIRE AND CABLE

A. Branch circuit and fixture joints for #10AWG and smaller wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".

B. Branch circuit joints of #8AWG and larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5-times the conductor's insulation. Tapes shall be fresh and of quality equal to Scotch.

C. Use UL listed pulling compound for installation of conductors in conduits.

D. Correspond each circuit to the branch number indicated on the panel schedule shown on the Drawings except where departures are approved by the District's Representative.

E. All wiring, including low voltage, shall be installed in conduit.

F. Control wiring to conform to the wiring diagrams shown on the Mechanical Drawings and the Manufacturer's Wiring Diagrams.

G. All splices in exterior pull boxes and light poles shall be cast resins encapsulated.

1. Power conductor splices - 3M Scotchcast Series 82/85/90; Plymouth or equal.
2. Control and signal circuits 3M Scotchcast series 8981 through 8986, Plymouth or equal.

H. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inch on centers. Tag all spare conductors.

3.05 CHEMICAL GROUND ROD

A. General

1. Install ground rod system in compliance with Manufacturer's instructions.
2. Install rods vertically. Where subterranean hard rock conditions prevent vertical installation horizontal "L" shape ground rod shall be installed.
3. Where ground rod is installed in an indoors dry location set ground box flush with finish floor. Where ground rod is installed outdoors set the top of the ground box four inches above finish grade.
4. Do not remove sealing tape from ground rod holes until time of installation in ground.
5. Separate ground rods from all other grounding electrodes and from each other by not less than 12-feet horizontal distance.

B. Excavation

1. Vertical installation bore a 12-inches diameter vertical hole in the ground six inches deeper than ground rod length.
2. Horizontal installations excavate a 12-inches wide trench, slope rod and trench to ensure end cap of rod is 2-inches lower than the elbow.

C. Backfill

1. Surround the entire rod with a minimum of 10 inches of bentonite clay mixed with water at six times volume to form a paste. Approximately 14-gallons for each 50-pounds of clay. Remove any excavation liners from the rod excavation area.
2. Install ground box and complete backfill.

D. Connect grounding electrode conductor(s) to ground rod.

3.06 CABLE RACKS

A. General

1. Provide cable racks in precast and cast-in place concrete pullboxes, manholes and cable trenches.

3.07 TESTING

A. Testing Conduit and Conduit Bends

The Contractor shall demonstrate the usability of all underground raceways, and field fabricated conduit bends installed as part of this Contract.

1. A round tapered segmented semi-rigid mandrel with a diameter approximately ¼-inch smaller than the diameter of the raceway, shall be pulled through each new raceway.
2. The mandrel shall be pulled through after the raceway installation is completed. Conduits which stubout only, may have the mandrel pulled after the concrete encasement is completed, but prior to completing the backfill.
3. District's Representative shall witness the raceway testing for usability. A Representative of the respective Utility Company shall witness the raceway testing where applicable.

4. Contractor shall repair/replace any conduit and conduit bend provided under this Contract which will not readily pass the mandrel during this test.

B. Refer to Section 26 05 00 Common Work Results for Electrical item 1.13 for Testing Requirements.

END OF SECTION 26 05 30

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SECTION 26 24 16
PANELBOARDS AND TERMINAL CABINETS

PART 1 GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment 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 Specification Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide Manufacturers catalog data for panels, cabinets and circuit breakers.

B. Provide Shop Drawing showing panel circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.

C. Provide nameplate engraving schedule.

D. Short Circuit, Coordination and Arc-Flash

1. Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and settings to provide the selective coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.
2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment. Shall comply with, but not limited to:
   a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
   b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
   c. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.
   d. CEC
4. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, disconnects, etc., shall each be labeled by the Manufacturer with “Electrical-Arc-Flash” warning signs. The signs shall explain a hazard to Personnel may

exist if the equipment is worked on while energized or operated by Personnel, to wear the correct protective equipment/clothing (PPE) when working “Live” or operating “Live” equipment and circuits.

1.03 SEISMIC EARTHQUAKE AND WIND LOADING WITHSTAND, TESTING AND CERTIFICATION (ADDITIONAL REQUIREMENTS)

A. General

1. The complete panels and terminal cabinets’ assemblies; including circuit protection devices, meter, housings / enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested.
    a. Wind loading all outdoor equipment locations.
    b. Earthquake seismic and CBC/IBC Seismic withstand all indoor and all outdoor equipment locations.
2. Shall withstand, survive and maintain continuous non-interrupted energized operation during the seismic event occurrences and wind event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.
3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation. Acceptance test seismic qualification shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.
4. Provide three-dimensional finite element analysis demonstrating anchorages and operational withstand of wind loading not less than as follows and as required by AHJ:
    a. 110MPH – West Coast States USA and Hawaii, per ASCE/SEI 7-16.
5. Seismic test shall be performed by a third-party independent Test Laboratory. Wind analysis and seismic testing and reports shall be certified, signed and “Stamped” by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.

PART 2 PRODUCTS

2.01 PANELBOARDS AND DISTRIBUTION PANELS

A. Shall be flush, or surface mounting as indicated with group -mount circuit protection devices as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.

1. Panelboards shall comply with the latest versions:
    a. NEMA – PB1.
    b. UL – 50 and 67.
    c. CEC.
    d. ASTM-B187.

2. Where indicated on the Drawings shall be furnished with sub-feed breakers and/or additional conductor lugs, split bussing, contactors, time switches, relays, etc., as required.
    a. Branch circuit panels up through 42-circuits shall be single section, to accommodate all the circuits and components.
    b. Distribution panels shall be single section or multi-section, to accommodate all the circuits and components.
3. Panels shall be “Service-Entrance” equipment rated when the panel main incoming supply feeder originates from one of the following:
    a. Originates outdoors exterior of the building in which the respective panel is located.
    b. Originates from an electrical supply source not located in the same building as the respective panel.

B. Housing and Painting, Panels and Terminal Cabinets
1. Shall be finished with one coat of rust inhibitor zinc chromate and coat of primer sealer after a thorough cleaning.
2. Finish color paint as selected by Owner’s Representative where exposed to public view (e.g., corridors, covered passages, offices, etc.). Prime coated panelboard shall be painted to match surroundings after installation in public areas.
3. Manufacturer’s standard color in electrical rooms/closets, janitors, HVAC and storage rooms.
4. Shall be fabricated of sheet steel of the following minimum gauges.
    a. Full height hinged, locking door. Trim #12-gauge steel; enclosure - code gauge steel.
    b. Panels installed in indoor dedicated electrical equipment rooms and dedicated electrical equipment closets, omit full-height hinged locking panel door. Dead front cover behind omitted panel door shall remain.
5. NEMA-1 Metal Housing, for indoor locations.
6. NEMA-3R Metal Housing, tamper resistant, for outdoor locations.
7. Furnish all panels and terminal cabinets with the Manufacturers flush locks and keys except where indicated otherwise herein. Keys and locks shall be interchangeable for all panels. Provide two latches and two locks for door heights exceeding 36-inches.
8. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.

C. Panels 208/120 volt, three-phase, 4-wire, S/N or 120/240-volt, single phase, 3-wire, S/N. Branch circuit panel as manufactured by:
1. Cutler Hammer “Pow-R-Line 1 or 2” Series
2. General Electric "A" Series
3. Square D “NF/NQ” Series
4. Siemens “P1/P2” Series

D. Branch circuit panels for 480/277 volt, three phase, 4 wire, S/N. Panelboard as manufactured by:
   1. Cutler Hammer "Pow-R-Line 2" Series
   2. General Electric "A" Series
   3. Square D "NF" Series
   4. Siemens "P1/P2" Series

E. Distribution panels as manufactured by:
   1. Cutler Hammer "Power-R-Line 3 or 4" Series
   2. General Electric "Spectra" Series
   3. Square D "I-Line" Series
   4. Siemens "P4/P5" Series

F. Top and bottom gutter space shall not be less than 6-inches high. Provide 6-inches additional gutter space in all panels where double lugs are required or where cable ampere size exceeds bus ampere size.

G. Panel dimensions.
   1. Panels with buss sizes 50-amp thru 400-amp.
      a. Shall be 20-inches wide. Surface or flush mounting as indicated.
      b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
      c. Depth shall be 5.75-inches nominal. Height of panel as required for devices.
   2. Panels with buss sizes greater than 400 amp.
      a. Narrow panels 24-inch (maximum) wide by 6.5-inches (maximum) deep units. Wide panels' 25-inch to 44-inches (maximum) wide by 8-inches to 15-inches (maximum) deep units. Nominal 90-inch panel height.
      b. The wider units shall be used only at locations where the narrow unit is not available with the quantity or size of large-ampere frame branch/sub-feed circuit protective devices shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.
      c. Distribution panels shall be floor standing and supported from behind the panels at walls.

H. Distribution panels and branch circuit panels maximum load rating
   1. Panelboards and Distribution Panels exceeding 800-amp load rating shall not be permitted.
   2. Provide Distribution Switchboards instead of Distribution Panels for bus load and circuit load ratings exceeding 800-amp.

I. Panel Auxiliary Cabinets
   1. Panelboards shown on the Drawings with relays, time clocks or other control devices shall have a separate auxiliary metal barriered compartment mounted above panel.

2. Panelboards with circuits controlled by low voltage remote control relays shall be provided with separate auxiliary cabinets to contain the relays, adjacent to the panelboard.
3. Provide auxiliary cabinets with separate hinged locking door to match panelboard.
4. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

J. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have circuit numbers imprinted to match circuit breaker numbers.
1. The panel identification nameplate shall describe the respective panel name and voltage, corresponding to the Contract Documents.
2. The electrical power source, name and location of each panel supply-feeder and supply equipment name shall also be identified and described on the respective panel name-plate.

K. SPD - Surge Protection Device
1. Provide each of the following branch circuit panel and distribution panel types with a SPD and RF filtering:
   a. 208/120 volt - single phase and/or three phase.
   b. 120/240 volt - single phase.
   c. 480/277 volt - single phase and/or three phase.
2. The SPD shall be installed inside the respective panel housing and shall be factory connected to each main phase, ground and neutral bus inside the panel.
3. The SPD monitor/annunciator indicators shall be visible only when the panel access door is in the open position.
4. Provide a 20-amp 3-pole (2-pole for single-phase panels) branch circuit protection device in each panel for SPD connection.
5. The SPD device and panel shall be UL labeled and listed for combined use. See related Specification Sections for Additional SPD Requirements.

2.02 SHORT CIRCUIT RATING

A. Circuit protective devices and bussing as indicated on the Drawings. All devices and bussing shall have a short circuit fault withstand and interrupting capacity not less than the maximum available fault current at the panel and as indicated on the Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the short circuit fault interrupting and withstand capacity be less than the following symmetrical short circuit.

	C/B and/or Bus Rating	Circuit Voltage	Short Circuit Amp
1.	400A and less	240V and below	10,000A
2.	400A and less	over 240V and below 600V	14,000A
3.	Over 400A, 800A & below	240V and below	42,000A
4.	Over 400A, 800A & below	over 240V and below 600V	30,000A

B. Panel Short Circuit Fault Rating

1. General

a. Provide a “fully rated” for short circuit fault interrupt and full load ampere main circuit breaker in each branch circuit panel and/or each distribution panel. Provide the main circuit breaker whether or not a main circuit breaker is shown otherwise on the Drawings, schedules or diagrams. The “utility-source” plus the “motor-load” transient contributions shall be used to establish the available fault duty values, unless indicated otherwise on the Drawings.

b. The panel main circuit breaker full load ampere capacity rating shall equal the respective panel main bus ampere rating.

c. The panel assembly, buss and circuit protection devices bolted fault short circuit withstand and bolted fault short circuit interrupt ratings shall not be less than 125% greater (including a 25% safety margin) than the available utility-source symmetrical and asymmetrical bolted fault short circuit current when “series combined rated” with the panel main circuit breaker.

d. The main circuit breaker rated “bolted-fault” short circuit fault interrupt and withstand short circuit rating shall not be less than 125% (including a 25% safety margin) of the upstream main service entrance “bolted-fault” available (symmetrical and asymmetrical) short circuit current.

2. Distribution Panelboards

a. Distribution panel, main circuit breaker, all feeder circuit breakers, and all branch circuit breakers shall be “fully-rated” (plus safety margin) for the available bolted fault short circuit current (including safety margin).

b. Shall provide time/current-tripping coordination with downstream equipment and upstream equipment.

3. Non-emergency branch circuit panelboards 400-amp buss and smaller; Non-emergency branch circuit panelboards 400-amp trip main circuit breaker and smaller.

a. The branch circuit panel main circuit breaker shall be “fully-rated” (plus safety margin) Current Limiting Circuit Breaker type (CLCB). Shall provide time/current-tripping coordination with upstream equipment.

b. The branch circuit panel main circuit breaker shall be “series-rated” with the panel downstream branch circuit devices and panel bussing. “The series-rating” shall provide short circuit bolted fault current withstand protection and short circuit bolted fault interrupt rating protection during a downstream 3-phase line-to-line and/or single-phase line-to-ground short circuit bolted faults.

c. Typical for branch circuit panelboards connected to normal-power (non-emergency) power circuits.

2.03 PANEL CIRCUIT BREAKERS, CIRCUIT PROTECTION DEVICES

A. Circuit Breakers General, for Distribution Panels and Panelboards

1. NEMA-AB1 and AB3 comply with latest revision.

2. UL-1087, UL-489 and IEC-60.947.2 rated devices comply with latest revision.

3. 5Hz AC closing and 3Hz AC trip and clear.

4. Main circuit breakers for distribution panels exceeding 400 amp and larger.
    a. Shall be Insulated Case Circuit Breaker type ICCB.
5. Main circuit breakers for branch circuit panelboards 400-amp buss and smaller.
    a. Shall be Current Limiting Circuit Breaker type-CLCB for non-emergency panelboards.
    b. Shall be Molded Case Circuit Breaker type-MCCB for emergency panelboards.
6. Branch circuit breakers and feeder circuit breakers smaller than 100-amp trip shall be Molded Case Circuit Breakers type-MCCB and/or Current Limiting Circuit Breakers type-CLCB.
7. All circuit breakers 100 amp and larger trip shall employ sensors and solid state digital electronic automatic trip system. Short-time and long-time Time/current curve shaping field adjustable functions and adjustable instantaneous trip. Typical for Molded Case Circuit Breaker type-MCCB, Insulated Case Circuit Breaker type-ICCB and Current Limiting Circuit Breaker type-CLCB.

B. Manufacturer
1. Circuit breakers as manufactured by the following companies, are acceptable only:
    a. Cutler Hammer
    b. General Electric Co.
    c. Square D Co.
    d. Siemens

C. Configuration
1. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the Drawings.
2. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
3. Panelboard circuit protection devices shall be bolt on type for connection to panel bus. Removable and installable without disturbing adjacent devices.
4. Provide conductor wire terminations (lugs) on each circuit protection device for incoming main feeder, branch circuits and outgoing feeder circuits. Dual rated copper/aluminum and compatible with the respective conductor size, type and quantity.
5. Where 2-pole or 3-pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.
6. Branch circuit panels shall be field convertible for bottom entry main incoming feeder or top entry main incoming feeder.
7. Each panel section, the feeder and branch circuit protection devices (3-phase and/or 1-phase) shall be “twin-mount”, side-by-side double row construction for the following circuit sizes:
    a. 480/277 volt, 60-amp circuit size and smaller.
    b. 240 volt – 208/120-volt, 100-amp circuit size and smaller.

D. Lock-Off and Lock-On

1. All circuit breakers shall be pad-lockable in the "off" position.
2. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall also be furnished with lockout clips, mounted in the “on” position. The breakers shall be able to trip automatically with lockout clips in place.
3. Provide lock-on clips on branch circuit breakers supplying fire alarm equipment and fire alarm panels. Provide identification of the dedicated "fire alarm" circuit function and operation. Color-code the circuit breakers to comply with AHJ Requirements.
4. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval. Other means of attachment shall not be accepted without prior written approval of the Owner's Representative.

E. Switch and Fuse Feeder Protective Devices for Distribution Panels

1. Locations where the Drawings show distribution panels employing switch-fuse circuit protection devices.
2. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class “R” fuses Current Limiting Fuses (CLF). Switches with ratings up to and including 100-amp at 240 volts shall be twins mounted. Switches rated through 60-amp and 480 volts shall be twins mounted. Provisions for padlocking in the “on” and/or “off” positions. Switches shall be removable from front of panel without disturbing adjacent units or panel bus structure.
3. Fuses shall be time delay current limiting types, UL Class RK-1 unless otherwise indicated on the Drawings.

   Provide one spare set of fuses of each size and type in each Distribution Panel.
4. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating, sizes and quantities shown on Drawings.
5. Switch and fuse devices shall be permitted only in distribution panels and only where specifically indicated on the Drawings for feeders.

2.04 PANEL BUSSING

A. Bus Material

1. Bussing shall be rectangular cross section tin-plated copper. As directed by Owner, aluminum panel busing shall not be permitted.
2. Bussing shall be non-tapped, full length of the enclosure.

B. Ground Bus

1. Each panel shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
2. Provide additional isolated ground bus in each panel with connecting isolated ground feeders and/or connecting isolated ground branch circuits.

C. Provisions

1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the Drawings.

D. Neutral Bus

1. The ampere rating of the neutral bus of panels and distribution panels shall be a minimum of 100% greater ampere capacity than the ampere rating of the corresponding phase bus, where the panel is indicated to be provided with an “oversize-neutral” or “200%” neutral on the Drawings.

2.05 TERMINAL AND AUXILIARY CABINETS

A. Cabinets

1. Fabricated of Code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the Drawings, and complete with hinged lockable doors, provide the quantity of 2-way Feed through conductor terminals required for termination of all conductors, plus 15% spares of each type.
2. Cabinet locks to operate from same key used for panel-boards. The trim to cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door into cabinets. All cabinets shall have ⅝-inch plywood backing, finished with fireproof intumescent primer and finish coat paint. Provide equipment ground bus in each cabinet.
3. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning. Where exposed to public view (e.g., corridors, covered passages, offices, etc.) finish color paint to match surrounding and manufacture’s standard gray color in switchboard, janitors, heater, and storage rooms.
4. Provide grounded metal barriers inside cabinet to isolate and separate line voltage and low voltage from each other inside the cabinet.

B. Cabinet dimensions.

1. Unless indicated otherwise on Drawings.
   a. Shall be 20-inches wide. Surface or flush mounting as indicated.
   b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
2. Depth shall be 5.75-inches nominal. Height of cabinet as required for devices, plus 25% spare unused interior space for future use, but not less than 36-inches high.

C. Terminals

1. Non-digital analog circuits; line and low voltage modular signal systems, 15-amp dual row with isolation barriers, screw-down terminals insulated strips, heavy duty.
   a. As manufactured by: Molex, or ITT-Cannon, or General Electric.
2. Digital circuits; low voltage signal systems, ANSI/EIA/TIA Category-6, 110-Block or 66-Block gas-tight punch down style, heavy duty.
   a. As manufactured by: Leviton, Ortronics, or AMP.

D. Identification (Additional Requirements)

1. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., “Life Safety System - Panel 2LS”, etc.).
2. Identify each terminal landing with unique circuit number and provide corresponding alphanumeric text-index card inside panel access door

PART 3 EXECUTION

3.01 MOUNTING

A. Flush mounted panelboards and terminal cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.

1. Panels and cabinets installed flush (recess or semi-recess) into fire rated or smoke rated walls. The wall recess shall be fully wrapped inside the recess with fire/smoke rated materials. The wrap-materials shall provide the same fire and/or smoke protection rating as the respective wall.

B. Surface mounted panels and terminal cabinets shall be secured to walls by means of preformed galvanized steel channels securely fastened to at least two studs or structural members.

C. Panelboards and terminal cabinets shall be installed to ensure the top circuit protective device (including top compartment control devices) are not more than 6-feet-6-inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on Shop Drawing submittals each panel where these conditions cannot be met.

3.02 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Provide a red and white bakelite nameplate with ½-inch high letters in each 277/480-volt panel fastened to face of dead-front plate, to read: “DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY”.

B. Manufacturer shall stencil the panel/cabinet number identification on the inside of door to correspond with the designation on the Drawings.

C. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

3.03 SPARE CONDUITS (ADDITIONAL REQUIREMENTS)

Provide three 1-inch conduit only stubs from each panel and terminal cabinet into accessible ceiling space. Where floor level below panel or terminal cabinet is accessible, also provide an additional three 1-inch conduit only stubs into accessible floor space.

END OF SECTION 26 24 16

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SECTION 26 50 00
LIGHTING FIXTURES

PART 1 GENERAL

1.01 SCOPE

A. Work Included:

All labor, materials, appliances, tools, equipment 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 Specification Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Submit certification letter from Manufacturers of Lamps and Ballasts and Power/Driver Supplies, (or alternately, Manufacturer's published catalog data) stating/showing the specific lamp, ballast, or power/driver supply combination comply with Manufacturer recommendation and approval for the combined use, shown on the Drawings.
2. Provide complete Manufacturers catalog data information for each light fixture (luminaire), ballast, power/driver supplies, lamps, materials, auxiliary equipment/ devices, finishes and photometrics.

B. Performance Certification

1. Submit Manufacturer's Certified Test Report Data showing compliance with Contract Document.
2. Submit Manufacturer's Letter of Certification for each fixture type, confirming the proposed combination of specific lamp, ballast, power/driver supply and auxiliary components for each light fixture (luminaire) type will function together correctly and perform in compliance with the Requirements of the Contract Documents as follows:

"The proposed drivers, (where, applicable), lamp sockets and fixture have been tested as an assembly. The proposed fixture products assemblies are certified by the Manufacturer to function within the required temperature, lumen output, electrical characteristics and operational life described in the Contract Documents".

C. Light Fixture Samples

1. If requested by the District's Representative, provide a sample of each fixture proposed as a substitution for a specified fixture. Sample fixture shall be complete with specified lamps, 3-wire grounding "SO" cord and plug for 120-volt 60Hz, AC plug-in operation. Sample fixtures shall be delivered to the District's Representative's Office for review, the samples shall be picked up within 10-working days after review comments have been received; any samples left beyond this time will be discarded by the District's

Representative. Decision of District's Representative regarding acceptability of any lighting fixture is final.

1.03 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)

A. Work and Materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Document Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:

1. UL – Underwriters' Laboratory:
   a. UL – 8750 and 1598C: Light Emitting Diode – LED Equipment for use in Lighting Products and Replacements
2. NEMA – National Electrical Manufactures Association:
   a. NEMA – LE4: Recessed Luminaries Ceiling Compatibility
   b. NEMA – SSL #1, #3 and #6: Electronic Drivers for LED; LED and Incandescent Lamp Replacement
   c. NEMA – LSD #44, #45, #49 and #51: SSL - Solid State Lighting
3. United States Federal Government:
   a. FCC – Part 18: EMI and RFI emissions limitations.
   b. EPA: Energy conservation publications and waste disposal regulations.
4. ETL and C.B.M. certified and approved.
5. Electrical installation standards, National Electrical Contractors' Association:
   a. NEIS/NECA and IESNA – 500: Recommended Practice for Installing Indoor Commercial Lighting Systems.
   b. NEIS/NECA and IESNA – 501: Recommended Practice for Installing Exterior Lighting Systems
   c. NEIS/NECA and IESNA - 502: Recommended Practice for Installing Industrial Lighting Systems.
6. Illuminating Engineering Society – IES (IESNA):
   a. IES – LM41: Photometric and Reporting.
   b. IES – 587: Transient Surge Protection.
   c. IES – LM79: Solid State Lighting (SSL) Testing and Measurement.
   d. IES – LM80: Testing for Lifetime of LED.
7. ANSI-American National Standards Institute:
   a. ANSI – C81
   b. ANSI – C82
   c. ANSI – C62.41: Transient Withstand
   d. ANSI – C78: Lamps
8. State California Code of Regulations - Title-24: Energy Code

PART 2 PRODUCTS

2.01 GENERAL

A. Complete Fixture

1. Provide light fixtures complete including lamps, drivers, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/lenses and outlet boxes.
2. Include an allowance of $300.00 to provide a light fixture for each lighting fixture outlet shown on Drawings without a fixture type designation.

B. Specific Fixture Requirements and Fixture Schedule Information

1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular Manufacturer only. The fixture length, number of lamps and lamp types, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other components required to fulfill the total description of the fixture based on all Drawing information, branch Circuits, Voltages, Specification information, and shall be included in the Contract Requirements regardless of whether or not the catalog number specifically includes these components.
2. Lighting fixtures shall be the types as indicated in Fixture Schedule on the Drawings and as described in the Specifications.
3. All fixtures of the same fixture type shall be the same Manufacturer and of identical finish and appearance, unless indicated otherwise on Drawings.

C. Manufacturer Certification of Operation

1. Lamps and lamp ballasts and power supplies (drivers) shall be recommended and certified by the respective Manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

2.02 POWER SUPPLIES (DRIVER-POWER SUPPLIES FOR LED-SOLID STATE LAMPS)

A. General

1. All ballast, power supplies, lighting fixtures assemblies and components shall be ANSI, ETL approved C.B.M. Certified and UL labeled.
2. Ballasts shall comply with FCC Part 18 Class-A and NEMA limits as to EMI or RFI and not interferes with normal operation of electrical or electronic data processing equipment.
3. Open circuit voltage, starting voltage, crest voltage and lamp-operating voltage shall comply with Requirements of the respective Manufacturer of the installed lamps.
4. Lamp ballasts, power supplies and transformers shall be for use with the specific lamps provided as part of the Contract.
5. Shall be suitable for use with automatic occupancy motion sensing type switching "on-off" control systems, with multiple "on-off" cycles per hour, on a 24-hours a day basis.

Operation shall be without loss of performance in operating characteristics described in the Contract Documents.

6. Fusing
   a. Shall be independently fused on the incoming line side within the fixture compartment.
   b. Alternately the Ballast Manufacturer may install the equipment fuse inside the ballast/power supply.
   c. Provide a label next to ballast cover reading: “Ballast (Power Supply) is fused, check fuse prior to relamping". Provide an additional quantity of 10**%** spare fuses and deliver to District’s Representative.
7. Ballast sound rating Class-A or better. Where sound-rating classification is not published, the ballast sound rating shall be the best of product manufactured. Ballasts, which are judged by the District’s Representative to be excessively noisy, shall be removed and replaced at the Contractor's expense with low noise ballasts.
8. Electronic solid-state ballasts and power supplies shall be the product of Manufacturer that has been producing electronic ballasts/power supplies for a minimum of 5-consecutive years prior to the date of the Contract.
9. Shall be designed and supplied to operate on the incoming line voltage system circuits to which the respective light fixtures are connected.
10. Shall not contain any PCB (polychlorinated biphenyl).
11. Power factor shall be not less than 0.90, starting and operating. The input starting transient line input ampere should never exceed lamp normal operating ampere by more than 10%.
12. Ballast and power supply disconnect:
    a. Lighting Fixture Manufacturer factory installed and prewired inside each light fixture, for lamp-ballast or lamp-driver power supply.
    b. Shall comply with UL-2459 and CEC. Shall disconnect (load-break) energized or de-energized ballast/driver from respective line voltage circuit and dimming circuit. UL-94V-0 flame retardant.
    c. Hot pluggable, multi-pole, insulated connectors, with strain relief and finger-safe squeeze-to-release latching function.
    d. Suitable for available voltage and ampere dimming and non-dimming lamp-ballasts and lamp-power supplies.
13. Ballast and power supplies as manufactured by General Electric, Advance, Philips, Universal, Sylvania/Osram or equal.

2.03 LIGHT FIXTURES (LUMINAIRES)

A. General

1. Lighting fixtures shall have all parts, ballasts, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.

2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.
3. Where fixture color is indicated to be selected by the Architect and/or District's Representative, provide two color chip samples for each color for review.
4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16 AWG "AF" or "CF" type-fixture rated copper wires, high temperature wire insulation for not less than 600 volts AC. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.
5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finish painting of the adjacent surface is completed.
6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.
7. Light fixtures installed outdoors, in damp or wet locations shall be UL labeled for said location as "damp-location" and "wet-location" for the respective installation location.
8. Fixtures in contact with thermal/building insulation shall be UL listed and rated for direct contact installation in thermal insulation systems.
9. Lamp auxiliary support brackets shall be heat-resistant, non-dielectric. Alternatively, metal auxiliary lamp support brackets shall be electrically isolated from the fixture, to prevent glass decomposition.
10. Lighting fixtures installed in masonry and/or concrete construction. The fixture housing shall be rated for "concrete-pour" installation location.
11. Provide a permanent label inside each light fixture stating the following relamping information. Not less than 0.125-inch high black alphanumeric characters on white back-ground.

    "Replacement lamp(s) installed in this light fixture must comply with the following criteria:

    *: CRI *: Lamp Watts
    *: CCT-K *: Lamp Lumens

    Only lamp rated * type lamp ballast shall be installed in this fixture."

    *Insert the value required for the specific lamp required by the Contract Documents for each light fixture.

B. Lens and Diffusers
   1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixture lenses shall be 100% virgin material.

2. Thickness of not less than 0.125-inch, as measured at the "THINIST" portion on the diffuser or lens. However, thickness shall be increased to sufficient construction and camber to prevent the lens and diffusers from having any noticeable sag over the entire normal life of the installation.
3. Diffusers shall be formed from cast sheet by a vacuum and/or pressure technique.
4. Lighting fixtures containing lamps with dichroic reflectors and light fixtures with non-dichroic lens/diffuser shall be rated for high temperature lamp operations resulting from lamp heat redirected (reflected) back into the fixture.

2.04 SOLID STATE LIGHTING (SSL), LIGHT EMITTING DIODES (LED) LAMPS, POWER SUPPLIES, AND LIGHT FIXTURES (ADDITIONAL REQUIREMENTS)

A. General
1. Solid State LED light source (lamps), related control equipment (driver-power supply), and luminaire (light fixture) optics for light output distribution.
2. Shall comply with the US-DOE Energy Star Program for SSL-LED. Submit documentation with Shop Drawings.
3. Shall comply with the latest revision IESNA LM-79 and LM-80. Submit documentation with Shop Drawings.
4. SSL chromaticity shall comply with latest revision NEMA and ANSI – C78.377. Submit documentation with Shop Drawings.
5. Submit with Shop Drawings two samples of each light fixture type employing SSL, with prewired 120 volt, 60Hz AC “SO” cord and plug-in cap.

B. LED Lamps
1. Lamp lumen output and overall efficiency shall be based on the LED lamps installed in specified fixture and ambient operating temperature.
2. Lamp Color Rendition Index (CRI) shall equal or exceed CRI – 80, unless noted otherwise on Drawings.
3. Lamp color output shall be 4000-degree K (±100K), unless noted otherwise on Drawings.
4. CRI and lamp color temperature shall be same for all light fixtures of the same fixture type.

C. LED Power Supply (driver)
1. Combination of power supply and SSL – lamp shall be Tested and Certified by respective Manufacturers for performance and proper operation.
2. Provide dimming type driver where indicated on Drawings. Driver and dimming equipment shall be Tested and Certified by respective Manufacturers for performance and proper operation.

D. Self-Contained LED Lamp and Driver, Integral “Screw-Base” and/or “Pin-Connect”, replacement assembly for incandescent lamps.
1. Shall be dimmable. Dimmer and lamp shall be certified by respective Manufacturers for compatible correct operation with each other.

2. Optical system and operating temperature thermal performance shall be compatible with light fixture.
3. Comply with latest revisions of NEMA LSD-49 and SSL-6.

2.05 EMERGENCY BALLAST LIGHTING AND EMERGENCY DRIVER LIGHTING

A. General

1. Self-contained emergency ballast and power supply (driver) containing batteries, battery charger, solid-state electronic control and lamp/ballast/driver operation, contained with-in a metal case, red finish case color.
2. UL–924, listed Emergency Lighting and Power Equipment, for installation inside and/or attached to lighting fixtures.
3. The emergency battery supply unit(s) shall be provided inside each respective emergency light fixture by the Fixture Manufacturer.
4. Normal operating temperature range from 0-degrees Centigrade up to operating ambient temperature inside respective lighting fixture, but not less than 50-degress Centigrade.
5. Provide a permanent label inside each emergency light fixture stating as follows, not less than 0.125-inch-high black alphanumeric characters on a white background:

   "Warning – this fixture provides more than one electric power source. Disconnect both normal and emergency sources including battery sources prior to opening fixture. Written permanent records documenting regular (every 30 days) emergency lighting function testing results shall be kept on file by the District."
6. UL and Manufacturer rated to supply the lamp and ballast/driver (power-supply) combination occurring in the respective light fixture, both dimming-type and non-dimming type light fixtures.
7. As manufactured by Bodine Inc. or IOTA-Engineering Inc.

B. Operation

1. Emergency mode

   When external AC electrical power fails, the emergency unit shall immediately and automatically switch to emergency mode. Maintain emergency lamp(s) illumination, while operating from the internal battery/electronics during the power failure for not less than 90-minutes continuous duration.
2. Normal Mode

   When AC electrical power is restored, automatically switch lamp(s) operation to external AC operation and begin battery-charging mode.
3. Battery Recharge Mode

   The battery charger shall automatically fully recharge discharged batteries in less than 24-hours, and prevent overcharging of the batteries, while maintaining a "float-charge" on the batteries.
4. The emergency battery unit shall operate not less than two lamps in multi-lamp light fixtures and one lamp in single lamp light fixtures. When operating in emergency mode

and battery power, the lamp lumen output of each lamp shall be not less than 40% of the lamp normal full lumen output rating of the lamp operation on normal power. The lamp-lumen output shall be 100% of the lamp normal full lumen output rating when operating in normal mode.

5. The emergency ballast shall provide cold-strike start and hot-restrike operation of the fixture lamp(s).
6. Periodic automatic, internal self-test, simulating normal power loss and actual operation of emergency lamps on internal battery power. Auto self-test shall occur not more than 30-day intervals. Audible and visual trouble alarm display, with manual alarm reset/ silence, for problems identified by auto-test functions.

C. Electrical Characteristics

1. Emergency equipment shall operate on the same input AC voltage as the normally "hot" branch circuit supplying the respective light fixture. Maximum line input load shall not exceed 15% more than normal fixture electrical load.
2. The emergency equipment shall be compatible for correct operation with the specific lamp/ballast/driver combination contained in the respective light fixture.
3. The emergency equipment shall be compatible with switched (on-off), non-switched (continuously on) and dimmer controlled lighting fixtures/circuits.

D. Components

1. Sealed nickel cadmium batteries, maintenance-free, rated for continuous operation in high ambient temperature, with 7-to-10-year operational life expectancy.
2. When standing on the floor below the fixture the emergency ballast test/monitor control panel shall be visible and readily accessible when the fixture is installed. The control panel shall provide:
   a. Charging indicator visual annunciator to display the charger and battery status.
   b. Momentary test switch/pushbutton to manually simulate power failure test.

PART 3 EXECUTION

3.01 LIGHT FIXTURE INSTALLATION

A. General

1. The Contractor shall verify actual ceiling and wall construction types as defined on the Architectural Drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The Contractor shall verify depth of all recessed lighting fixtures with Architectural Drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall be reported to the District's Representative prior to release of order to the Supplier of the fixtures.
2. On acoustic tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four corners or at the center of the joints of two tiles.
3. The Contractor shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the District's Representative.

4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the Site Plan and Floor Plan Electrical Drawings. The voltages shown on the fixture schedule are for generic fixture information only.
5. Install and connect lighting fixtures to the circuits and control sequences indicated on the Drawings and to comply with respective Manufacturer's instructions/recommendations.
6. Lighting fixtures in building interstitial spaces, in mechanical plumbing and electrical spaces/rooms, are shown in their approximate locations. Do not install lighting outlets or light fixtures until the mechanical, plumbing and electrical equipment/pipes/ductwork are installed; then adjust and install lighting in revised clear (non-interfering) locations to provide best even-illumination. Coordinate the locations with all other trades prior to lighting installation.

B. Lighting Fixtures Installed in Ceiling Support Grids - Suspended Lay-in "T-bar" and Concealed Spline Ceilings.
1. Provide two seismic clips at opposite ends of each recessed light fixture, the clip shall connect to the ceiling grid main runners and the light fixture. The light fixture with seismic clips and ceiling grid runner connections shall resist a horizontal seismic force equal to the total weight of the light fixture assembly.
2. Each light fixture weighing 40-pounds or less and where the respective ceiling grid system is "heavy duty" type, shall be suspended directly from the ceiling grid or shall be suspended independent of the ceiling grid support system as approved by the AHJ. Each light fixture weighing more than 40-pounds or where the ceiling grid system is not a "heavy duty" type shall be supported independent of the ceiling grid and independent of ceiling grid support system.
3. Each light fixture supported independent of the ceiling grid system shall be supported with a minimum of four taut independent support wires, one wire at each fixture corner.
4. Each light fixture supported directly from the ceiling grid or ceiling grid support system shall be additionally connected with a minimum of two independent slack safety support wires. One wire at each opposite diagonal fixture corner. Each 3-feet by 3-feet and larger light fixture shall be supported in the same manner, except provide a minimum of four independent slack safety wires, one at each fixture corner.
5. Light fixtures surface mounted to a suspended ceiling shall be installed with a 1½-inch steel – "C" Channel which spans across and above a minimum of two parallel main ceiling grid "runners" and concealed above the ceiling. Each channel or angle member shall be provided with a minimum of two threaded studs for attaching to the fixture housing through the lay-in ceiling tile. Two steel "C" Channel members shall be installed for each 4-feet (or smaller) fixture. Install the channels within 6-inches of each end of the light fixture to span a minimum of two ceiling grid parallel main runners. Provide two seismic clips connecting the ceiling grid main runners to each steel – "C" Channel. Provide not less than two taut independent support wires connecting to each channel. Bolt the light fixtures to the threaded studs on the channels or angles, to support the light fixture tight to the ceiling surface.

C. Fixture Supports

1. The support wires for light fixture support shall be 12-gauge steel (minimum). The wires including their building and light fixture attachments shall provide support capacity of not less than four times the weight of the light fixture assembly. Provide additional light fixture support wires and building anchors to meet these Requirements, as part of the Contract. The support wires shall be anchored to the building structural elements above the ceiling.

2. Pendant mounting fixtures shall be supplied with swivel hangers. Fixtures shall swing in any direction a minimum of 45 degrees of gravity, position. Fixtures shall have special stem lengths to give the mounting height indicated on the Drawings. Stem to be single continuous piece without coupling, and to be finished the same color as the canopy and the fixture, unless otherwise noted. The Contractor shall check all lock nuts and set screws to rigidly secure the swivel socket to the stem, and the stem to the outlet box.

   Fixtures shall be plumb and vertical. Where obstructions occur restricting 45-degrees free-swing of fixtures, the fixtures shall be "guy" wired to prevent fixtures from striking obstructions. The District's Representative shall approve method of guying. Swinging fixtures shall have an additional safety hanger cable attached to the structure and the fixture at each support, with the capacity of supporting four times the vertical weight of the light fixture assembly.

3. Suspended fixtures weighing in excess of 40-pounds shall be supported independently of the fixture outlet box. Provide "air craft" (minimum 12 gauge) steel hanger cable for suspended fixtures route cable concealed or in pendant where possible. Each cable attachment shall support four times the weight of the fixture assembly. Securely attach the cable to the building structure.

4. Surface mounted fixtures installed on drywall or plaster ceilings and weighing less than 40-pounds may be supported from outlet box. Provide structural supports above drywall or plaster ceilings for installation of fixtures weighing more than 40-pounds and secure fixture to structural supports. The use of toggle bolts is prohibited.

C. Recessed Lighting Fixtures - Fire Rated Building Surfaces

1. Lighting fixtures recessed in ceiling or wall which has a fire resistive rating of 1-hour or more shall be enclosed in a fully enclosed backbox (except over fixture lens/diffuser). The material used to fabricate the "enclosed backbox" shall have a fire rating equal to that of the respective ceiling or wall.

2. The space from the fixture to the box enclosure shall be a minimum of 3-inches.

3. The backbox shall be concealed behind the fire rated ceiling and wall finish surface. The light fixture shall be provided with lamp ballast rated for (normal light output) operation in a "high" ambient temperature.

3.02 LENS AND DIFFUSERS

Lens, diffusers, internal reflectors shall be completely cleaned of all dust, dirt and finger-prints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupying the facility by the District.

3.03 COMMISSIONING LIGHTING FIXTURES (ADDITIONAL REQUIREMENTS)

A. General

1. Verify correct lighting control configurations and operation in each room.
2. Simulate normal source power failure by "opening" (turn off) building main service disconnect and verify connections and operation of each emergency lighting fixture.
3. Confirm "EXIT" sign directional arrows are visible in each "EXIT" sign.
4. Verify light fixture support-hangers, ceiling grid clips and seismic restraints comply with the Contract Documents.
5. Remove protective shipping/installation shields on fixtures. Verify fixtures and lamps are clean and free of construction debris. Clean light fixtures found to be contaminated or dirty.
6. Setup, program, and function test lighting control systems to perform each of the indicated control functions, area/room zones and sequences.
7. Provide “aiming”, directional adjustment of light fixtures, both indoor and outdoor. Aiming shall comply with Manufacturer’s aiming diagrams, and as directed by District’s Representative.

B. Sample Spot-Check in each room the following lighting fixture information:

1. Lamp type and performance data.
2. Ballast type and performance data.
3. Combined lamp/ballast certification of performance and compatibility by respective Manufacturer.
4. Verify instructional signage is placed inside each lighting fixture in compliance with Contract Documents.

END OF SECTION 26 50 00

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SECTION 26 60 10

ELECTRONIC NETWORK SYSTEMS INFRASTRUCTURE

PART 1 GENERAL

1.01 CODES AND STANDARDS COMPLIANCE

A. TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises

B. TIA-568-C.1 Commercial Building Telecommunications Cabling Standard

C. TIA-568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standards

D. TIA-568-C.3 Optical Fiber Cabling Component Standard

E. ANSI/TIA/EIA-569-C-2012 Commercial Building Standard for Telecommunications Pathways and Spaces

F. ANSI/TIA/EIA-570C-2012, Residential and Light Commercial Telecommunications Wiring Standard

G. ANSI/TIA/EIA-606B-2012, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

H. ANSI/TIA/EIA-607B-2011 Commercial Building Grounding and Bonding Requirements for Telecommunications

I. ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers

J. Building Industries Consulting Services, International (BICSI)Telecommunications

K. Distribution Methods Manual (TDMM) – 12th Edition

L. FCC Part 68

M. National Fire Protection Agency (NFPA) - 70, National Electrical Code (NEC) - 2011.

1. Global Engineering Documents, 15 Inverness Way East, Englewood, C), 80112-5776, 800-854-7179, fax: 303-397-2740, http://global.ihs.com/

2. IEEE-Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY, 10017-2394, 800-678-IEEE, fax: 732-981-9667, http://standards.ieee.org/

1.02 ASSOCIATED REFERENCES:

A. ISO/IEC 8802-3 (IEEE 802.3)

B. ISO/IEC 8802-5 (IEEE 802.5)

C. ANSI X3T9.5 Fiber Distributed Data Interface (FDDI) Physical Medium Dependent (PMD)

D. ANSI X3T9.5 Twisted Pair Physical Medium Dependent (TP-PMD)

1.03 SYSTEM DESCRIPTION

A. Backbone Pathway: Conform to EIA/TIA, using conduit as indicated.

B. Horizontal Pathway: Conform to EIA/TIA, using raceway and cabinets as indicated.

C. Backbone Cabling: Conform to EIA/TIA. Provide a combination of fiber-optic cable (both multi-mode and single mode), Category 6 cable, and for the backbone with quantities as indicated on the Drawings. See cable count section for detail number of cables. Provide a backbone

cabling system complete from outlying buildings to the Main Distribution Frame (MDF) and from the MDF to all Intermediate Distribution Frames (IDF).

D. Horizontal Distribution Cabling: Terminate using 568-B single-user enhanced Category 6, 4-pair UTP cables complete from each jack (there are multiple jacks per outlet) to the associated intermediate distribution frame. Unless indicated otherwise on Drawings, Each outlet will have a minimum of three each. Cat 6 cables with RJ45 connectors at the IDF. All cables terminated to RJ45 patch panel.

E. Distribution Frames: Install Chatsworth racks at all MDF and IDF locations. Space limitations may require installation of wall hung cabinets (requires pre-approval by Owner). Install all required patch panels, fiber termination panels, fiber couplers wire management, and connectors; at each of the MDF's and IDF's to complete the structured cabling system.

F. Active Devices: Provided and installed by Owner.

1.04 SUBMITTALS

A. Submit under provisions of Section 01330.

B. Shop Drawings: Include outlet and cabling labeling and identification scheme (Conforming to TIA/EIA-606A), floor plans indicating all outlets, racks and other associated equipment; all products with catalog cuts clearly identifying the product types and numbers; rack elevations showing all patch panels, wire management devices and space for all Owner supplied active devices; and all warranties.

C. Test Documentation

1. Test documentation shall also be presented in electronic format, PDF file preferred. The test equipment by name, Manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the Manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test. Testing submittals for Manufacturer's warranty shall comply with Manufacturer's Requirements.

2. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

D. Provide detailed documents indicating the proposed grounding scheme.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01770.

B. Record actual locations and sizes of pathways and outlets.

C. Mark Project Record Documents daily to indicate all changes made in the field.

1. In addition to General Requirements of Project Record Drawings, indicate on Drawings, changes of equipment locations, alterations in raceway runs and sizes, changes in installation details, etc.

2. Use red to indicate deletions and green to indicate additions.

3. Use the same symbols and follow, as much as possible, the same drafting procedures used on the Contract Drawings.

D. Locate underground conduit stubbed-out for future use, underground feeder conduits, and feeder pullbox locations using building lines by indicating on the Project Record Drawings.

E. The installation Contractor will obtain two set(s) of (D-) size Drawings at the start of the Project. One set will be designated for the central location to document all as-built information as it occurs throughout the Project. The central set will be maintained by the Contractor's Foreman on a daily basis and will be available to the Architect/Owner upon request during the course of the Project. Anticipated variations from the Building Drawings may be for such things as cable routing and actual outlet placement. No variations will be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by the Owner. Contractor shall also redraw the Site and Floor Plans showing all fiber, copper, racks, and information outlets as well as the labeling scheme for all items. These Drawings shall be created using current versions of AutoCAD. A computer CD and the paper copies shall be turned over to the Owner with the O&M manuals.

1.06 QUALIFICATIONS

A. The Telecommunications Contractor shall be an approved Leviton Certified Installer for at least 90 days prior to Project.

B. The Owner reserves the right to require the Contractor to remove from the Project any such employee the Owner deems to be incompetent, careless or insubordinate.

C. All clean up activity related to work performed will be the responsibility of the Low Voltage Contractor and must be completed daily before leaving the site.

1.07 PRE-INSTALLATION CONFERENCE:

A. Schedule a conference for a minimum of 5-calendar days prior to beginning work of this Section.

B. Agenda: Clarify questions related to work to be performed, materials to be used, scheduling, Coordination, etc.

C. Attendance: Communications System installer, General Contractor, Architect, Owner's Representatives, and other parties affected by work of this Section.

1.08 WARRANTY

A. Installation Warranty

1. Provide Leviton system warranty covering the cabling system against defects in workmanship, components, and performance for "Lifetime" from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original Installation Specifications after repairs are accomplished. This warranty shall be provided at no additional cost to the Owner.

2. System shall be installed by an Authorized Leviton Installer with greater than 6 months of experience installing the system. The Leviton Authorized Installer must provide certificates of completion of the Leviton Certification Course for Technicians who will be installing the system.

B. Cable System Warranty

1. A Lifetime Performance Warranty covering all components, equipment and workmanship shall be submitted in writing with the system documentation. The warranty period shall begin on the system's first use by the Owner.
2. The Project must be pre-registered with Leviton before installation has begun and final testing submitted per to Leviton in original tester format.
3. Should the cabling system fail to perform to its expected operation within this warranty period due to inferior or faulty material and/or workmanship, the Contractor shall promptly make all required corrections without cost to the Owner.

1.09 REGULATORY REQUIREMENTS

A. Conform to Requirements of NFPA 70.

B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of premises wiring for 1-year from Date of Substantial Completion.

B. Installer will be notified of any defects in labeling and installation and a resolution to the problem is expected within 7 working days.

PART 2 PRODUCT

2.01 MANUFACTURER

Manufacturer shall be Leviton or Leviton approved partner. NO SUBSTITUTIONS WILL BE ALLOWED.

2.02 OUTLETS

2.03 EACH LOCATION WITH AN OUTLET SHALL CONTAIN NO LESS THAN 2 CAT6 CABLES. ADDITIONAL CABLES MAY BE SPECIFIED ON DRAWINGS

A. Telecommunications and Data Outlet Connector Module: Jacks: Eight-wire, eight-position, modular, Termination of all connectors shall be 110-type insulation displacement connectors (IDC). The connector shall provide a ledge directly adjacent to the 110-style termination against which the wires can be terminated and cut in one action by the installation crafts-person. Connector wiring is universal and will accommodate installation color codes for T568A and T568B wiring schemes. Leviton eXtremeTM 6+ (p/n 61110-RW6) (white). Match jacks to Category rating of attached horizontal distribution cable. Each jack shall be fed by a separate four pair cable sheath. All four pairs shall be wired to the data jack.

B. Faceplates: Icon-able 110 connect faceplates. Color White. Provide a minimum of four ports. Use duplex mounting straps as required in floor box or surface raceway applications. All modular jacks shall be oriented with the locking tab slot towards the floor.

1. Faceplate: Leviton Model #42080-6WP (white).

2. Blank Inserts: Provide blank inserts in all unused ports. Leviton Model #41084-BWB (white).

C. Faceplates for modular furniture to be supplied by Installer and coordinated with District for installation during/after furniture installation.

1. Most modular furniture will use Leviton QuickPort Modular Furniture Faceplate, 4-port white # 49910-HW4. Exact part # to be coordinated with District.

2.04 RACKS/CABINETS

A. MDF Rack: Minimum two each 19-inches wide x 84-inches high x 24-inches deep, floor-mounted. Provide larger or multiple racks where required to accommodate all cables, cross connect hardware, and active devices. Chatsworth Universal Rack Part Number 48353-703. Color: Black.

B. IDF Rack: Minimum one each 19-inches wide x 84-inches high x 24-inches deep, floor-mounted. Provide larger racks where required to accommodate all cables, cross connect hardware, and active devices. Chatsworth Universal Rack Part Number 48353-703. Color: Black.

C. Cable Management:

1. Horizontal Cable Management: Provide a minimum of two front wire management panels in each rack. One combination front and rear horizontal wire management shall be provided for each fiber termination box, for each 24 ports of RJ45 panels, and for each 24 ports of hubs or switches. (p/n 49252-PCM). All racks shall be furnished with a minimum of 25 Velcro cable ties to ensure a neat and manageable system.

2. Vertical Wire Management: Vertical wire management shall be supplied for all open racks. Vertical wire management shall be Chatsworth vertical management (six required per rack).

3. Inter-bay/End-cap Cable Managers: Where required provide inter-bay and end-cap management panels. The inter-bay manager shall have integral routing and slack storage loops supporting a 1.5-inch minimum bend radius. Inter-bay and end-cap management panels shall be supplied with adjustable routing guides. Both inter-bay and end-cap units shall have removable covers secured with ¼-turn fasteners. Inter-bay and end-cap cable managers shall securely attach to the rear rail of the rack with #12-24 screws. A cable trough shall be supplied at the bottom of each rack to support patch cord routing between racks.

D. Ground Bus: Provide a TMGB ground bus at the MDF and a TGB ground bus at each IDF. B-line # SB-476, SB-477.

E. Power Supply: Install an APC NET9RMBLK surge suppression power strip with a cord long enough to reach the rack power supply.

2.05 FIBER-OPTIC CABLE

A. Exterior (Backbone from other buildings to the MDF)

1. Use: Berk-Tek Type Water-Blocked/ Sunlight Resistant Indoor/Outdoor tight buffer fiber optic cables.

a. Indoor/Outdoor fiber-optic cables.

b. OFNR type where used as a riser.
c. Glass Type
d. Plenum rated cable where installed in any kind of air plenum.

2. Single Mode Fiber-Optic Cable:

Berk-Tek Type Water-Blocked/ Sunlight Resistant Indoor/Outdoor tight buffer fiber optic cables.

a. Meet Requirements of the EIA/TIA-568-A Standard Specification.
b. Use OFNR type where used as a riser.
c. Gel-filled construction.
d. All dielectric, 6-strand, single mode (9/125) cable with each fiber component surrounded by an individual aramid yarn strength member.
e. Fiber: Single mode 8.3-micron core.
f. Cable core mini-bundle loose tube.
g. Minimum Bend Radius: 128mm.
h. Minimum Crush Resistance: 200 N/cm.
i. Minimum Short-term Tensile Load: 448 lbs.
j. Minimum Optical Fiber Rating: 100 Kpsi.
k. Provide cable in full, factory packaged reels marked with the respective cable part number and lot number by the Manufacturer. Factory test reports and Contractor's acceptance tests must accompany each reel of cable.
l. Termination shall be with Leviton FastCAM LC Single-mode Connector (49991-SLC).
m. All fibers must be guaranteed.

3. Multimode Fiber-Optic Cable:

Berk-Tek Type Water-Blocked/ Sunlight Resistant Indoor/Outdoor tight buffer fiber optic cables.

a. Meet Requirements of the EIA/TIA-568-A Standard Specification.
b. Use OFNR type where used as a riser.
c. All dielectric, 6-strand, multi-mode (62.5/125) cable with each fiber component surrounded by an individual aramid yarn strength member.
d. Minimum Bend Radius: 128mm.
e. Minimum Crush Resistance: 200 N/cm.
f. Minimum Short-term Tensile Load: 448 lbs.
g. Minimum Optical Fiber Rating: 100 Kpsi.
h. Optical Transmission:
    1) Maximum Attenuation: 3.5 dB/km @ 850 nm and 1.25 dB/km @ 1300 nm.
    2) Minimum Bandwidth: 200 MHz/km @ 850 nm and 500 MHz/km @ 1300 nm.
i. Provide cable in full, factory packaged reels marked with the respective cable part number and lot number by the Manufacturer. Factory test reports and Contractor's acceptance tests must accompany each reel of cable.
j. Termination shall be with Leviton FastCAM LC Multimode 62.5um Connector (49991 -MLC).

k. All fibers must be guaranteed.

B. Interior (Intra-building Backbone)

1. Use:
   a. Indoor fiber-optic cable.
   b. OFNR/OFNP type where used as a riser.
   c. Glass Type
   d. Plenum rated cable where installed in any kind of air plenum.
   e. Termination shall be with Leviton FastCAM LC Multimode 62.5um Connector (49991 -MLC).
   f. Termination shall be with Leviton FastCAM LC Single-mode Connector (49991-SLC).

2.06 DATA/TELEPHONE CABLES

A. Use:

1. CMP plenum rated cables in all air plenum spaces.
2. Use gel-filled type cable for exterior backbone. Berk-Tek CUPIC – F 24 AWG cable.

B. Data Cables:

1. Manufactured in compliance with TIA/EIA-568-A as applicable.
2. Berk-Tek LanMark-6 Cable Cat 6+ UTP Plenum Rated, 4-pair, UTP, 100 ohm, 23 AWG Solid cable with a Blue outer jacket.
3. Provide cable in full, factory packaged reels marked with the respective cable part number and lot number by the Manufacturer.

2.07 CROSS-CONNECT TERMINATION HARDWARE

A. Fiber Termination Patch Panels:

1. Minimum Size: 12 fiber optic connectors with the appropriate number of connector panels and couplers. Leviton Opt-X ULTRA Enclosures (part #'s 5R1UH-S03 and 5R2UH-S06) with loaded Adapter Plates.
2. Adapter Plates (SM part #'s 5F100-4LL 24 Port or 5F100-2LL 12 Port) or (MM Aqua part #'s 5F100-4QL 24 Port or 5F100-2QL 12 Port). Fill all unused locations with Blank Adapter Plate Panels (part # 5F100-PLT).
3. 19-inches rack mountable; hinged to provide complete access to connectors and slack storage from the front and equipped with cable strain relief brackets.
4. Fiber termination panels shall provide ample storage and handling for up to 10 feet of slack per fiber strand.
5. Fiber termination panels shall protect both the installed cable and patch cord cable inter-face when the panel is in the closed position.
6. Provide LC type couplers in standard adapter plates, colors to be blue for Single-Mode, Gray for Multi-Mode quantity as appropriate to fiber count. Provide additional plates and couplers where required to terminate all fiber strands entering the rack.
7. All single mode LC connectors shall be Leviton FastCAM, Blue in color.

8. All multimode LC connectors shall be Leviton FastCAM, Gray in color.
9. Fiber optic termination hardware shall be sized to accommodate required strand counts plus 20% growth.
10. Provide blank adapter panels as required.

B. Single Mode Fiber-Optic Cable Connectors:
1. Termination shall be with Leviton FastCAM LC Single-mode Connector (49991-SLC).
2. Leviton FastCAM

C. Multi-mode Fiber-Optic Cable Connectors:
1. Termination shall be with Leviton FastCAM LC Multimode 62.5um Connector (49991-MLC).
2. Leviton FastCAM

D. Category 6 Patch Panels:
1. Minimum Size: 24-port.
2. Wiring Pattern: T568B.
3. Complete with label spaces, all modular jacks shall be oriented with the locking tab slot towards the floor.
4. Provide quantity of patch panels as required to accommodate all Category 6 UTP cables entering rack. Number of ports in panels to exceed required number of used ports by 20%.
5. Leviton Model eXtreme TM 6+ (p/n 69586-U**) Universal Patch Panel.

E. Patch Cables: Single-Mode Optical Fiber Duplex Patch Cords. Provide dual-fiber patch cables with LC type connectors on one end and LC connector on the other 3 meters in length for all new installations and LC type connectors on one end and LC connector on the other 3 meters in length for all new to existing installations, for each pair of single mode fiber installed. Provide 10% spare cables to Owner.
1. Category 6 patch cables: Provide one 5-foot, and one 10-foot, unshielded cable white in color, for each workstation jack, Use Leviton SlimLine Patch Cables (6D460-xx*). Provide 10% spare cables to Owner for each type of patch cable.
2. Fiber-optic patch cables: Provide an LC 50/125 dual fiber jumper patch cable with one LC type connector on one end and LC duplex type (5LDLC-M03) second end for each multi-mode fiber in each MDF and IDF, 3-meters in length for new installations. Provide LC type connector on one end and SC duplex type (5LDCL-M03) second end for each multi-mode fiber in each MDF and IDF, 3-meters in length for new installations. Provide 10% spare cables to Owner.

2.08 PROJECT CABLE COUNTS

A. Install six new single mode fiber cables from HH to IS Data Center

B. Extend six existing multimode fiber cables to new IDF in HH.

C. Extend existing multimode EMS fiber to new IDF

D. Terminate existing Telephone wires to new IDF in HH. Maintain existing daisy chain of existing phone cables.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

All cables shall be furnished by the Contractor in full, factory packaged reels. The reels shall be marked with the respective cable part number and lot number by the Manufacturer. Upon request by the Owner, the Contractor shall provide Manufacturers with proof of compliance with the required manufacturing guidelines presented in the aforementioned standards. Each reel shall be visually inspected upon receipt and prior to installation to ensure that no damage was incurred during shipment. Any damaged cable shall be returned to the Vendor/ Manufacturer for replacement. The cost for replacement cable shall be borne by the Contractor. Any residual cable, in lengths greater than 500 feet, shall be delivered to the Owner and the Owner shall decide the disposition of the cable.

3.02 INSTALLATION

A. Racks/Cabinets

1. The Contractor shall be required to install, secure and ground the racks.
2. Securely attach floor mount racks to the concrete floor using ⅜-inch hardware.
3. Secure open racks to the overhead cable ladder using appropriate attachment hardware.
4. Ground all racks to the telecommunications ground bus bar.
5. Rack mount screws (#12-24) not used for installing fiber panels and other hardware shall be bagged and left with the rack upon completion of the installation.
6. Install inter-bay and end-cap managers to the rear mounting rail of the rack using all available mounting holes.
7. Securely fasten Interducts and cables to the cable managers.
8. Alternate cable feeds left and right to minimize congestion at the top of the rack.
9. Install wall mounted racks with a minimum of six 5/16-inch lag bolts or masonry anchors into structural building members.
10. Install power outlet for cabinet within the cabinet. Do not mount outside cabinet.

B. Backbone Cabling

1. Install a continuous, backbone cable from each outlying building to the MDF. Install a continuous, backbone cable from the MDF to each new IDF. These cables shall be of the same Manufacturer of all the other fiber and copper cabling system and terminations.
2. Install all backbone cables in conduit.
3. Gel-filled fiber optic cable which extends more than 50 feet within a building shall be installed in rigid conduit.
4. Install backbone cables separately from horizontal distribution cables.
5. Where cables are housed in conduits, install the backbone and horizontal cables in separate conduits.

6. Where backbone cables and distribution cables are installed in a pathway system, back-bone cables shall be installed first and bundled separately from the horizontal distribution cables.
7. All fiber optic cable shall be installed per industry standards. This includes using a proper break-away swivel and sealing the end of all cables before pulling through any conduit system. Ten feet of slack cable shall be left at each end of the cable run for future maintenance purposes.
8. OSP, loose-tube cables shall be properly prepared and protected per industry standards. All cables shall be properly cleaned; the cable ends shall be terminated in a unit and a 900-micron buffer tube for each fiber strand. Each cable OSP buffer tube shall be labeled for strand counts contained therein. Where 250 micron coated cable is field terminated, provide breakout kits that build up the fiber to a minimum of 900 microns shall be used. Provide proper break out kits.
9. Data cabling shall not occupy the same conduits as other low-voltage systems to ensure the data network can be up-graded and expanded in the future without disturbing the other critical communications systems.

C. Horizontal Distribution Cabling
1. Install horizontal distribution cables from the MDF and IDF to all workstation data outlets as indicated on Plans. Install one continuous horizontal cable from each data jack back to the associated MDF or IDF. If a data outlet has more than one jack, install one cable for each jack. Unless indicated otherwise on Drawings, install a minimum of three cables (CAT 6+) for each outlet indicated on the Plans. Provide additional cables where specifically indicated on the Plans.
2. Install all cable in conduit in in-accessible space.
3. Install cable in accordance with Manufacturer's recommendations and best industry practices.
4. Do not fill cable raceways greater than the NEC maximum fill for the particular raceway type.
5. Conduit sizing:
   a. Minimum of 1 inch conduit for each outlet. Each outlet shall be fed by a single home run conduit. "Daisy Chaining" of outlets is not acceptable.
   b. For conduits feeding a multiple outlet surface raceway the sizing shall be as follows:
      1) 1-inch for raceways 6-feet long and under.
      2) 1½-inch for raceways 6-feet to 18-feet long.
      3) Multiple conduits to meet this pattern for lengths greater than 18-ft.
   c. These Specifications shall take precedence over conduit routing shown on the Plans that deviate from this method. The data Contractor shall bring any discrepancies to the attention of the Owner before bid time.
6. Cables shall be installed in continuous lengths from origin to destination (no splices) unless specifically addressed in this document.
7. Where cable splices are allowed, they shall be in accessible locations and housed in an enclosure intended and suitable for the purpose.

8. Do not exceed the cable's minimum bend radius and maximum pulling tension.
9. Cable Not Installed In Conduit:
    a. Cable may be installed exposed (not in conduit) only in readily accessible areas and only where indicated on the Plans or in this Specification.
    b. When not installed in conduit, (per the Plans and Electrical Specifications Requirements), support all horizontal cables at a maximum of 4-foot intervals.
    c. At no point shall cable(s) rest on acoustic ceiling grids or panels, nor shall they be attached to ceiling grid wires.
    d. Horizontal distribution cables shall be bundled in groups not greater than 40 cables. Bundles shall be supported by cable tray, conduit, trapezes, or multiple support straps.
    e. Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
    f. Under no circumstances shall cable be installed exposed (not in conduit) above enclosed (hard lid) ceilings, the use of access doors is not acceptable.
    g. Cables shall not be attached to ceiling grid or lighting support wires. Where light support style wires for drop cable legs are required, the Contractor shall install clips to support the cabling.
10. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.
11. Cables shall be identified by a self-adhesive label in accordance with TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a Section of cable that can be accessed by removing the cover plate.
12. Unshielded twisted pair cable shall be installed so that there are no bends less than four times the cables Outside Diameter (4 X cable O.D.) at any point in the run and at the termination field.
13. Pulling tension on 4-pair UTP cables shall not exceed 25-pounds for a single cable or cable bundle.
14. A minimum 6 inches of slack shall be left in the outlet box to allow at least one re-termination.
15. All cables and their termination on each end shall be labeled per TIA/EIA. All labeling schemes and label designations shall be reflected on the CAD Drawings at the end of the Project and in the submittals. A bound copy of the cable designations showing the termination point by floor, room number and where in the room each patch panel jack is assigned shall be attached to the rack in each MDF and IDF.
16. Cable Terminations
    a. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA Document, Manufacturer's recommendations and/or best industry practices.
    b. Pair untwist at the termination shall be per Manufacturers recommendation.

c. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
d. The cable jacket shall be maintained as close as possible to the termination point.
e. All modular jacks shall be oriented with the locking tab slot towards the floor.
f. Data jacks that are in surface raceway shall be mounted in the proper termination plate by the Manufacturer of the raceway to ensure that the customer gets a professional end product. These termination plates and trim are to be provided by the Electrical Contractor installing the raceway and power outlets to ensure that all outlets and trim will match.
g. Each jack shall be fed by a separate four pair cable sheath. All four pairs shall be wired to the jack using TIA/EIA-568-B wiring scheme.

17. Data cabling shall not occupy the same conduits as other low-voltage systems to ensure the data network can be up-graded and expanded in the future without disturbing the other critical communications systems.

D. Inter-Building Multi-Pair Copper Backbone for Voice Terminations

1. In the MDF, install 110 Wall Mounted Frames on Backboard adjacent to the PBX
   a. Use Leviton Velcro (43115-075*) to support both Backbone and Horizontal Cabling.
   b. Provide Leviton 110 Extension Mounting-Frame Kit (41MB2-EXT) adjacent to the PBX Wall Field and appropriate 110 Horizontal and Vertical Management.
   c. Use waterfall type cable management to provide strain relief for both Backbone and Horizontal Cabling transitioning from the Wall Field to Racks.
   d. Do not over tighten cabling bundles.
   e. All cabling to be neatly dressed and secured with Velcro Straps.
   f. All cabling and terminations shall be tested to applicable Standards.
   g. Install and provide all necessary components, accessories and system management to secure all communications infrastructure.
   h. Provide proposed Cabling Plan prior to construction to Citrus College Project Manager for approvals.

E. Data Outlets

1. This section only applies to outlets not installed in surface raceway.
2. The outlet plate shall be affixed to an in-wall or surface mount box with two screws, which match the color of the outlet plate.
3. Wall mount boxes shall be attached to box eliminators, 4-inches X 4-inches boxes, or old work boxes.
4. Install faceplates in a horizontal or vertical orientation as required.
5. Any unused faceplate positions shall be covered/filled with a blank insert made of the same or compatible material as the faceplate and shall be molded in the same color. Blank spaces shall be incorporated between populated positions on the faceplate.
6. Cables shall be coiled in the in-wall or surface-mount boxes. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. A minimum of 6 inches of slack shall be stored in an in-wall box, modular furniture raceway, or insulated

walls. Excess slack for these situations shall be neatly coiled in the ceiling above the drop location.

F. Cross-connect Termination Hardware

1. The backbone side of the horizontal cross-connect, and the main cross-connect shall be terminated in the same termination panels as the horizontal cables. The backbone fibers shall be maintained in separate termination panels from the horizontal distribution fiber cables. The backbone termination panels shall be installed in the rack. Termination details and rack elevations for fiber panel placement shall be provided in the Contractor submittals.
2. The Contractor shall only be required to install those fiber termination panels provided by the Contractor into the enclosures. Placement of the enclosures shall be detailed in the Contractors Working Drawings.
3. Each fiber optic cable shall be terminated in the MDF and IDF in a LEVITON enclosure providing protection to the terminated fibers. The enclosures shall provide a strain relief bracket for attaching the optical fiber cable and support slack storage of a minimum of 10 feet per fiber cable. The enclosure shall provide a minimum of 12 ports for fiber terminations and fully enclose both the hardwired cable and the patch cord terminations when the shelf is closed.
4. Fiber termination panels must be of the same Manufacturer as the fiber cable and LC connectors, as well as the horizontal cabling system to ensure the Owner will not have any Coordination problems in the future.

G. Labeling and Identification

1. All cables and their termination on each end shall be labeled per TIA/EIA. All labeling schemes and label designations shall be reflected on the CAD Drawings at the end of the Project and in the submittals. A bound copy of the cable designations showing the termination point by floor, room number and where in the room each patch panel jack is assigned shall be attached to the rack in each MDF and IDF.
2. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cable's origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the As-built Drawings and all test documents shall reflect the appropriate labeling scheme.
3. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet labels will be the Manufacturer's label provided with the outlet assembly.
4. Labeling at the workstation end will consist of destination of cable, rack number, patch panel number, port number. I.E. MDF-1-1-45.

H. Grounding and Bonding

1. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential for

acting as a current carrying conductor. The TBB shall be installed independent of the buildings' electrical and building ground and shall be designed in accordance with the recommendations contained in the TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

2. The main entrance facility/equipment room in each building shall be equipped with a Telecommunications Main Grounding Bus bar (TMGB). Each telecommunications closet shall be provided with a Telecommunications Ground Bus bar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between tele-communications equipment and the electrical system to which it is attached.
3. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the TC or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors. Where metallic panels attached to the rack to not have sufficient metal to metal contact to provide an adequate path to ground, they shall be bonded to the rack using a minimum #14 AWG copper conductor. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack mount equipment. The conductor shall be continuous; attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using the appropriate compression connector.
4. The Electrical Contractor shall provide a #6 building ground wire to each data rack from the corresponding building grounding electrode system. This ground will be connected to the MDF or IDF grounding bus for the grounding of all the telecommunications equipment.
5. All wires used for telecommunications grounding purposes shall be identified with green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and buss-bars shall be identified and labeled in accordance with the System Documentation Section of this Specification.
6. The TBB shall be designed and/or approved by a qualified PE, licensed (actual or reciprocal) in the State that the work is to be performed. The TBB shall adhere to the recommendations of the TIA/EIA-607 Standard and shall be installed in accordance with best industry practices. Installation and termination of the main bonding conductor to the building service entrance ground, at a minimum, shall be performed by a licensed C10 Electrical Contractor.

I. Firestop Systems

1. A firestop system is comprised of the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, heat, vapor and pressurized water stream.
2. All penetrations through fire-rate building structures (walls and floors) shall be sealed with an appropriate firestop system. This Requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire

rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

3. Firestop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a Qualified Professional Engineer (PE), Licensed (actual or reciprocal) in the State where the work is to be performed. A Drawing showing the proposed firestopped system, stamped/embossed by the Cognizant PE shall be provided to the Owner's Technical Representative prior to installing the firestop system.
4. All firestop systems shall be installed in accordance with the Manufacturer's recommendations and shall be completely installed and available for inspection by the District Inspector prior to cable system acceptance.

3.03 TESTING

A. All cables and termination hardware shall be tested 100% for defects in installation to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by the Contractor prior to system acceptance. Any defect in the cable system installation including but not limited to cable, connectors, feed-through couplers, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable conductors in all cables installed.

B. Category 6 cables shall be certified to meet or exceed the Category 6 Specifications set forth in TIA/EIA-568-C Certifications shall include the following parameters for each pair of cable installed:

1. Wire map (pin to pin connectivity)
2. Length (in feet)
3. Attenuation
4. Near End Crosstalk (NEXT)
5. Far End Crosstalk (FEXT)
6. ELFEXT
7. Attenuation/Crosstalk Ratio (ACR)
8. Return Loss
9. Propagation Delay
10. Delay Skew

C. Fiber Optic cables shall be certified to 10GBs minimum.

D. Copper

1. Each cable shall be tested for continuity on all pairs and/or conductors. Coaxial cables shall be tested for continuity, opens shorts and resistance using a Volt/Ohm Meter (VOM) and installed length using a Time Domain Reflectometer (TDR). Twisted-pair voice cables shall be tested for continuity, pair reversals, shorts, and opens using a "green light" type test set. Twisted-pair data cables shall be tested for all of the above Requirements, plus tests that indicate installed cable performance. All Category 6 cables shall be tested to ensure the Category 6 standard performance is complied with. All tests shall be printed out in hard copy in the quantity called out in the General Specifications

for O&M turn over documents as well as one disc copy for the Owners use. These data cables shall be tested using a *(Class VI*) cable analyzer.

2. Continuity
   a. Each pair of each installed cable shall be tested using a "green light" test set that shows opens, shorts, polarity and pair-reversals. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test set in accordance with the Manufacturers recommended procedures and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length
   a. Each installed cable shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the TIA/EIA-568-A Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the longest pair length shall be recorded as the length for the cable.
4. Performance Verification
   a. High speed Unshielded Twisted Pair (UTP) data cable shall be performance verified using an automated test set. This test set shall be capable of testing for the continuity and length parameters defined above, and provide results for the following tests:
      1) Near End Cross-Talk (NEXT)
      2) Attenuation
      3) Ambient Noise
      4) Attenuation to Cross-Talk Ratio (ACR)
      5) Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard, and the result shown as pass/ fail. Test results shall be printed directly from the test unit or from a download file using an application from the Test Equipment Manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

E. Fiber

1. All fiber terminations shall be visually inspected with a minimum 200 X microscope to ensure that no surface imperfections exist. In addition, each fiber strand shall be tested for attenuation with an optical power meter and light source. Cable length and splice attenuation shall be verified using OTDR.
2. Attenuation
   a. Single mode optical fiber attenuation shall be measured at 1310 nm and 1500 nm using a laser light source and power meter. Tests shall be performed at both wave-lengths in one direction on each strand of fiber. The set-up and test shall be per-formed in accordance with EIA/TIA-526-7 Standard, Method 1A. Two-meter patch cords shall be used as test references and for the actual test. This test method

utilizes a one jumper reference, two jumper tests to estimate the actual link loss of the install cable plus two patch cords.

b. Test evaluation for the panel to panel (backbone) shall be based on the values set forth in the EIA/TIA-568-C, Optical Fiber Link Performance Testing.

c. *For this application, the length based on cable length measurements marked on the jacket, will be suitable. OTDR testing is to be performed in accordance with 8.2.2, and then the actual measured length shall be used. Conversion from metric to US Standard measurement shall use 3.2808 as a constant with the result rounded to the next highest whole number.

d. **The testing for this project is measuring the loss over the installed cable plus two jumpers which account for three mated pairs of connectors. Subtract one mated pair for the equipment interface to arrive at a total of two mated pairs under test.

3. Length and Splice Loss

a. Each cable shall be tested with an Optical Time Domain Reflectometer (OTDR) to verify installed cable length and splice losses. The OTDR measurements for length shall be performed in accordance with EIA/TIA-455-60. The measurements to determine splice loss shall be performed in accordance with Manufacturer's recommendations and best industry practices. These tests shall be employed on all cables after installation and in addition where one or more of the following conditions exist.

b. OTDR and power meter testing is specifically requested by the Owner.

c. Each strand shall be tested on all outside plant and tight-buffered cables and/or where splices exist.

d. A Representative strand of each fiber cable shall be tested to verify length if the estimated cable length is within 10% of the maximum length specified, respective to cable function, in the TIA/EIA-568-C Standards.

3.04 CABLE SYSTEM ACCEPTANCE

A. The Owner's Technical Representative will make periodic reviews of the Project in progress. One review will be performed at the conclusion of cable pulling, prior to closing of the false ceiling, to verify the method of cable routing and support, and the firestopping of penetrations. A second review will be performed at completion of cable termination to validate that cables were dressed and terminated in accordance with TIA/EIA Specifications for jacket removal and pair untwist, compliance with Manufacturer's minimum bend radius, and that cable ends are dressed neatly and orderly.

B. Final Review

C. Upon completion of the Project, the Owner's Technical Representative will perform a final review of the installed cable system with the Contractor's Project Foreman. The final review will be performed to verify that all horizontal and backbone cables were installed as defined in the Drawing package, and that the installation meets the aesthetic expectations of the Owner.

3.05 TEST VERIFICATION

Upon receipt of the test documentation, the Owner reserves the right to perform spot testing of a representative sample of the cabling system to validate test results provided in the test

document. Owner testing will use the same method employed by the Contractor, and minor variations will be allowed to account for differences in test equipment. If significant discrepancies are found the Contractor will be notified for resolution.

3.06 SYSTEM PERFORMANCE

During the 4-week period between final inspection and delivery of the test and as-built documentation, the Owner will activate the cabling system. The Owner will verify operation of the cabling system during this period.

END OF SECTION 26 60 10

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SECTION 27 51 26
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 this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit block wiring diagrams and catalog data showing component interconnection and descriptive literature for all component parts and cabinets.

1.03 EQUIPMENT QUALIFICATION

A. All Equipment shall conform to Federal, State and Local applicable Codes, Ordinances and AHJ, and shall be listed and labeled by Underwriters Laboratories.

B. Assistive-Listening Systems

1. Assistive-listening systems shall be provided in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.
2. 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 the receivers provided, but no less than two shall be hearing-aid compatible in accordance with CBC Section 11B-706.3.
3. 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.

PART 2 PRODUCTS

2.01 GENERAL

A. The Assistive Listening System shall include the following items

1. Instructor (program source) wireless transmitter units.
2. Student (audience) 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 wirelessly 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. Shall provide automatic stereo or mono audio full system operation, depending on program source input.
4. The system in each space shall comply with Federal ADA, State and Local AHJ Requirements for the hearing impaired.

2.02 MATERIALS (RF WIRELESS)

A. General

1. Power for each portable unit operation shall be supplied by internal, changeable rechargeable 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 10-hours with NiCad (NiMH) batteries. The batteries shall be rechargeable without removal from unit.
2. Provide power on-off control on each unit, to extend battery duration.
3. A protection circuit shall prevent battery "back-drain" if the power to the charger is turned off while the unit is being recharged.
4. The receivers and transmitters shall be US Government FCC and Industry Canada-approved, for FM-RF (radio frequency) wireless operation.
5. All components shall be the product of the same Manufacturer.
6. As manufactured by Williams Sound; or PhonicEar; or Listen Technologies; or Centrum Sound.

B. Instructors Portable (Program Source) RF Transmitter Units

1. The transmitter shall be compact, easily portable units, self-contained ABS, plastic housing/enclosure shall clip to a pocket or belt.
2. Each portable transmitter shall provide RF transmitting on one of the US Government 40 different FCC – and Industry Canada-approved narrow-band channels in the 72-86MHz RF band.
    a. Line-of-sight transmit distance range of not less than 100-feet up to 150-feet from transmitter to receiver.
3. Easy-to-read channel label and volume adjustment on the front unit face. Stereo and mono audio processing.

4. 3.5mm auxiliary input jack that allows transmission of audio from an auxiliary source such as a cassette recorder, computer, CD/DVD player or television audio source. The transmitter shall also provide a second 3.5mm microphone input source jack. The two input sources shall be simultaneously operational to provide a mixed signal output RF transmission of the two sources.
5. Select the separate independent RF transmission frequency for each transmitter to prevent transmission interference between units and to provide for at least two student receiver units to selectively overlap reception of the transmitter.
6. Quantity of instructor's portable RF transmitters
    a. Provide quantity of nine instructor portable transmitters, three-on low band: three-on mid band and three-on high band RF frequencies.
    b. Provide a quantity of one portable transmitter at the respective room audio/video (A/V) equipment, program output source. Provide 120-volt AC-to-DC power-supply for portable transmitter at the A/V equipment location.
7. Extended range fixed base non-portable RF transmitter.
    a. Provide fixed location non-portable base unit RF transmitter for spaces larger than 9,000 square foot indoor or outdoor spaces.
    b. Shall have the same RF characteristics and performance as the portable transmitter except as follows:
        1) Line-of-sight transmit distance range of not less than 800-feet from transmitter to receiver.
        2) Fixed install location non-portable, with NEMA-1 metal housing.
        3) Radiated RF energy intensity shall provide manual attenuation adjustments to prevent multiple adjacent RF interferences.
    c. Provide a student/audience portable RF receiver unit at the RF base unit to receive RF signals from an instructor's RF transmitter. Connect the base unit to rebroadcast. Provide a self-contained 120-volt AC-to-DC power-supply for the portable receiver at the base unit transmitter.
    d. Shall operate on 120-volt 60Hz AC branch circuit. Provide remote system master on-off control.
    e. Provide remote RF antenna (outdoor/indoor) rated, for fixed base RF transmitter. Antenna shall extend the transmitter range for large spaces. Provide two RG-6 coaxial cable connects from antenna to base transmitter.

C. Student/Audience Receiver Units
1. The multi-channel narrow-band FM receivers shall be compact easily portable units, self-contained ABS/plastic housing/enclosure and shall clip to a pocket or belt.
2. The receiver shall provide an on/off switch and volume control which adjusts the output level as required by the listener.
3. The receiver shall have a 3.5mm output jack which accepts one of any of the plug-in listening accessories. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation.

4. The receiver shall have an easy-to-read channel label on the front face. The receiver shall incorporate an automatic squelch circuit which eliminates white noise when the receiver is out of transmission range. Stereo and mono audio reception and processing.
5. The multi-channel receiver shall receive any six of the US Government forty different FCC- approved narrow-band FM frequencies within the 72-76MHz band from the respective transmitter units. The user shall be able to change to any one of these six frequencies by using a slide or rotary switch on the receiver. Label on the front face shall indicate the receiver is a multi-channel unit. A label inside the battery compartment shall indicate the six channels that are available to the user.
6. Quantity of portable RF receivers
    a. Provide a quantity of two receivers with matching frequencies for each transmitter, not less than eighteen total quantities of receivers.
    b. Provide a quantity of one receiver with matching RF frequency of the transmitter at the respective room audio/video (A/V) equipment, program input source. Provide 120-volt AC-to-DC power-supply for portable receiver at the A/V equipment location.
    c. Provide hearing aid compatible units at a ratio of one per four receivers in accordance with ADA 219.3.

D. RF System Accessories

1. Battery recharger portable charger/organizer pack.

   Locking, portable case with cover, shall accept a group of not less than twelve plug-in portable transmitter and receiver 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) transmitters receivers provided as part of the Contract.
2. Stereo audio headset-style automatic noise canceling microphone, integral on-off-volume control and with behind-the-neck support style each with cable and outlet plug-jacks to match transmitter jacks. Provide two cables for each transmitter.
3. Equipment wall mount support brackets.
4. Auxiliary audio program source 15-feet long cables with plug-in at both ends to match transmitter jacks. Provide two for each transmitter.
5. Stereo audio headset style ear phones with cable and plug to match receiver jacks. Head-sets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation. Provide one headset for each receiver.
6. Rechargeable Ni-Cad (NiMH) batteries, one complete set for each transmitter and receiver unit.
7. Locking auxiliary equipment storage cases for cables, microphones and headsets, with quantity and capacity for all auxiliary accessories furnished as part of the Contract.

2.03 MATERIAL (INFRARED WIRELESS)

A. General

1. All equipment shall be the product of the same Manufacturer.

2. The receivers and transmitters shall be US Government FCC and Industry Canada-approved.
3. Provide power on-off control on each unit, to extend battery duration.
4. As manufactured by Williams Sound; or PhonicEar; or Listen Technologies; or Centrum Sound.

B. Master (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. The emitter shall be mounted by the following methods:
   a. Fixed to a wall with an adjustable, wall-mounting support bracket accessory.
   b. Portable mounted to a table-top-or floor-stand, using accessory support-stand adapter.
6. 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 3000 square feet, the infrared transmitter/ emitter infrared output shall be reduced to accommodate the actual smaller room square feet size and height.
7. 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.
8. Slave emitter/transmitter for rooms exceeding 30,000 cubic feet. Provide one additional infrared emitter/transmitter repeater slave unit, for each additional 30,000 cubic feet room volume, or fraction thereof. The slave repeater shall receive and retransmit the program signals from the master unit. Provide one 100-foot long "master-to-slave" auxiliary portable extension wire cable for each slave unit.
9. Provide wall mount plug-in outlets for instructors' microphone outlet connect ports to emitter/transmitter.
   a. Provide 1.0-inch conduit and wire, homerun connect from microphone outlet to each room respective emitter/transmitter and slaves. Provide conductors as recommended by Manufacturer.
   b. Provide 1.0-inch conduit and wire homerun connect from microphone outlet to respective room Audio/Video (A/V) equipment, microphone program source input. Provide conductors as recommended by Manufacturer.

10. Provide a quantity of nine emitter/transmitter “master” units, plus additional “slave” units for adjusted room sizes.

C. Student/Audience 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.
2. The receiver shall be a dual-channel unit for wearing around the neck with an adjustable strap. Stereo and mono audio reception and processing.
3. Compatible with the transmitter (emitter) and operate on 2.3MHz 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.
4. 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° acceptance angle.
5. Audio squelch circuit which turns the output circuit off when the infrared signal is reduced or not received, with on/off and volume control.
6. Output jack, which accepts any of the listening accessories. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation.
7. Shall be compact easily portable units, self-contained ABS/plastic housing/ enclosure with red infrared receiver lens. Shall clip to pocket or belt.
8. Provide quantity of two infrared receivers for each master transmitter, not less than eighteen total quantities of receivers.

D. Infrared System Accessories

1. Battery recharger portable charger/organizer pack.

   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.
2. Stereo audio headset style automatic noise canceling microphones, integral on-off-volume control and with behind-the-neck support style. Each with 25-feet long extension cables and outlet plug-jacks to match transmitter outlet jacks. Provide two cables for each emitter/transmitter.
3. Equipment wall mount support brackets.

4. Auxiliary audio program source 15-feet long cables with plug-in at both ends to match transmitter jacks. Provide two for each transmitter.
5. 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.
6. Rechargeable Ni-Cad (NiMH) batteries, one complete set for each unit.
7. Locking auxiliary equipment storage cases for cables, microphones and headsets. Quantity and capacity as required to store all accessories.
8. 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.
9. Locking, portable case for infrared emitter/transmitter. One for each emitter/ transmitter unit.
10. Provide microphone extension cable with plug to match microphone and infrared emitter /transmitter microphone input jack, 25-feet 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 is complete.

B. Wireless RF Units
   1. Perform an onsite RF frequency survey to determine available unused RF channels, prior to selecting unit operating channels and prior to ordering the equipment.
   2. Select operational RF frequency to prevent system RF interferences with other equipment.
   3. Provide - one 0.75-inch conduit with two Category–6A, ANSI/EIA/TIA-568C 4-pair, UTP cables connecting from each emitter/transmitter master outlet box location to respective room instructors microphone outlet box location. Provide matching RJ-45 Category-6A female jacks at each outlet box for each cable. Provide an audio circuit matching Balun at each outlet RJ-45 jack location, for RJ-45-to-portable cable plug-in transition and circuit impedance matching audio/transformer, into respective equipment. Additionally provide four portable Category-6A patch cables with RJ-45 jacks on each end of 7-foot-long patch cable. Typical for each outlet location.

C. Wireless Infrared Units
   1. Provide aiming and intensity adjustments of emitter/transmitter units to ensure complete room coverage.
   2. Provide - one 0.75-inch conduit with two Category–6A, ANSI/EIA/TIA-568C 4-pair, UTP cables connecting from each emitter/transmitter master outlet box location to respective room instructors microphone outlet box location. Provide matching RJ-45

Category-6A female jacks at each outlet box for each cable. Provide an audio circuit matching Balun at each outlet RJ-45 jack location, for RJ-45-to-portable cable plug-in transition and circuit impedance matching audio/transformer, into respective equipment. Additionally provide four portable Category-6A patch cables with RJ-45 jacks on each end of 7-foot-long patch cable. Typical for each outlet location.

3. Provide - one 0.75-inch conduit with two Category–6A, ANSI/EIA/TIA – 568C, 4-pair UTP cables connecting from each emitter/transmitter master outlet box location to respective room audio amplifier/preamplifier location. Provide matching RJ-45 Category-6A female jacks at each outlet box location for each UTP cable. Provide an audio circuit matching Balun at each outlet RJ-45 jack location, for RJ-45-to-portable cable plug-in transition and circuit impedance matching audio/transformer, into respective equipment. Additionally provide four portable Category-6A patch cables with RJ-45 jacks on each end of 7-foot-long patch cable. Typical for each outlet location.

END OF SECTION 27 51 26

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SECTION 28 31 00
INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment 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 Specifications Sections and Drawings for related work required to be included as work under Division 26, 27 and 28.
2. General Provisions and Requirements for electrical work.

1.02 QUALIFICATION OF BIDDERS AND EQUIPMENT

A. To qualify as an acceptable Bidder, whether the bid is submitted to the District, his Agent, a General Contractor or a Sub-Contractor, the System Bidder or Contractor shall be Qualified Contractor and shall hold a valid License issued by the State of California Department of Consumer Affairs Collection and Investigation Services for the purpose of installing security systems. The System Bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted Authorities Having Jurisdiction over the work. The Contractor shall be the Factory Authorized Distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least 5-years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

B. The Equipment specified herein shall be DMP #XR-500N or equal.

C. The System shall be serviced by a field supported 2-year warranty.

D. The Specification is based on the Equipment of Manufacturers who has been approved by the District and the Manufacturers herein named shall be considered as meeting the Requirements of this Specification. For all items which are identified by part number and Manufacturer the Performance Specifications which are published in the most recent Manufacturers data sheets available at the time of bidding this Project shall be applicable to the present work as though fully written out herein.

E. All Equipment shall conform to all Local Applicable Codes and Ordinances and shall be listed by Underwriters Laboratories.

F. Installation Certification

1. Work and Material for Cables, cable terminations and related components shall be performed by Certified Installers. The Installer shall be certified by the respective Product Manufacturers.
2. The Manufacturers of the indicated work and material shall provide an Installer education/training and Certification Program for the supplied products.

3. The Installers performing the Contract Work for the indicated products shall have attended and successfully completed each of the respective Manufacturer's Installation Training Education Programs for the specified products.
4. Submit six copies of the Manufacturer's Certifications for each Installer performing the work. The submittal shall be approved prior to initiating any related Contract Work.
5. Contract material installed, and work performed by Installers not complying with these Requirements shall be removed. Removal of work and material not in compliance with these Requirements shall done at the Contractor's expense, without any additional cost to the Contract and without any additional Contract completion due date extensions. New material and work required to replace the non-compiling removed work and material shall be provided at the Contractor's expense, without any additional cost to the Contract and without any additional Contract completion due date extensions.

1.03 PERFORMANCE REQUIREMENTS

A. Provide Main Control Panel, Terminal Cabinets, Keypads, and Site Underground Conduits as indicated.

B. Provide Motion Sensor(s) in each room having exterior doors, exterior glass, or skylights. Quantity of sensors in each room shall be as required to detect entry through exterior doors, exterior glass, or skylights.

C. Provide a Magnetic Switch at the entry door to each building, near its respective keypad. Connect to the system to initiate a timing circuit for keypad operation.

D. Provide Magnetic Switches at roof hatches.

E. Provide all conduits, cabling, and outlet boxes required for a complete and operable system.

F. Meet with Representatives of the District at a time and location convenient to the District. Advise the District of programming options and incorporate all Requirements onto the Shop Drawings before submittal to the Architect.

1.04 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit Evidence of having met with District Representatives as specified herein.

B. Submit Product Data Sheets for all switches, keypads, wiring devices, device plates, controllers, power supplies, cabinets, etc.

C. Submit Detailed Shop Diagrams including Dimensioned Plans, Elevations, Details, Schematic and Point-to-Point Wiring Diagrams and descriptive literature for all component parts and cabinets.

D. Submit six copies redrawn Building Floor Plans showing all components of the intrusion detection system including interconnecting cabling and conduits. Sensors shall be located on the Drawings in the location conforming to the Requirements stated herein. Drawings shall be prepared to scale and show all exterior glass, exterior doors, all interior and exterior building walls, roof hatches, Architectural and Structural Elements relevant to the installation of the system. Each zone shall be shown on the Plans.

PART 2 PRODUCTS

2.01 SYSTEM FUNCTIONS

A. Provide a Complete and Operable Supervised Intrusion Detection System as shown on the Plans including but not limited to master control panel, key pad stations, motion detectors, connections to door switches, a State Fire Marshal listed digital communicator and an automatic dialer.

B. Upon Detection of an intruder by initiation of any device in the system, the system shall cause the annunciator LED to light and sound an alarm signal on the school's telecommunication system. Alarm information shall be sent by digital dialer to Central Station Alarm Monitoring Agency.

C. Systems shall detect the motion of a body taking not more than four steps in an area secured with motion detection equipment where entry doors or windows are possible access.

D. Each Building Area shall be on a separate zone with each zone controlled separately so that any building area may be secured while others remain unsecured.

E. The System shall be capable of off-site computerized access for remote access, programming and control.

2.02 CONTROL PANEL

A. Control/Communicator Panel shall be a DMP control panel with an integral digital communicator and shall be Underwriters Laboratories listed. All external circuit connections shall be UL listed as power limited in accordance with the provisions of Article 760 of the California Electrical Code (CEC).

1. Provide Point of Protection (POPEX) modules at the control panel for Popit module super vision.
2. Provide Point of Protection Identification Transponders (Popit) modules at building terminal cabinets to individually identify each detector in the system.

B. The Control/Communicator shall be IP based.

C. System shall include the following features:

1. Real time clock and test timer.
2. Battery charging circuit.
3. Battery voltage supervision.
4. Supervised automatic reset circuit breakers.
5. Onboard warning buzzer and diagnostic LEDs.
6. Automatic answer modem.
7. Lightning and RFI protection.
8. Central Station reporting format.
9. Printer/CRT interface module for on-site serial data printer recording or CRT display of events.
10. Quad serial output module for enhanced serial data interface capability for specific accessory modules and devices.

11. Individual zone responses.
12. Custom annunciator text.
13. Audible alarm output, steady or pulsed.
14. Automatic silencing.
15. Attack-Resistant enclosure and lock meeting Underwriters Laboratory Local Burglary Requirements.
16. A minimum of eight auxiliary form "C" dry contacts for a variety of programmable responses to alarm and trouble conditions.
17. Transformer enclosure for internal mounting of Class 2 transformer.
18. Two telephone numbers with selective signaling options.
19. Individual zone responses.
20. Automatic test reports.

2.03 BAR-CODE PROGRAMMER FOR DIAGNOSTICS AND PROGRAMMING CAPABILITY.

2.04 RECEIVER

A. Receiver shall be Bosch Security System #D6600 Series, UL listed for fire and intrusion detection.

B. Provide a 50VA Class 2 plug in transformer for power input.

C. System shall contain 48 hours of standby power utilizing rechargeable sealed lead acid batteries and a battery charger.

D. System shall be FCC approved for telephone connections.

E. An Alphanumeric LCD Display shall indicate account number, area number, time, date, event, zone or point number, line or group number, status and external devices.

F. Twenty-four-hour Clock and 128 year calendar.

G. Forty Character Line internal printer and interface capability with an external serial printer.

H. Transmission Verification appropriate with the format utilized.

I. Storage of 249 separate events.

J. Transmission Format shall support the control panel.

K. Turn the Receiver over to the District for Central Station or Campus Monitoring.

2.05 REMOTE ACCOUNT MANAGER

A. System shall be Bosch Security Systems #D5300 Series or equal with all equipment necessary for computerized access, programming, diagnostics, and remote control of the system. It shall be possible to remotely change passcodes, locate faults, shunt problem zones, arm and disarm the system, silence alarms, and control the auxiliary output contacts in the control panel.

B. System shall permit remote diagnostics including utility and battery power conditions, phone line condition, event memory by zone, and current clock and calendar settings.

C. System shall be 100% IBM compatible for use with personal computers.

D. System shall include a plug-in modem and software necessary for a complete and operable installation. Furnish the District with a Software License Agreement for updated software enhancements as they develop.

2.06 KEYPADS

A. Master Keypad shall be DMP or equal capable of displaying system status and controlling the alarm system. Unit shall receive its operating power from the main control panel. Keypad shall be flush-mounted on a wall near the entry doors of each building. Faceplate shall be brass or stainless steel as selected by the Architect.

B. Sub-Zone Keypads shall be DMP or equal to allow individual zones to be bypassed. Keypad shall be flush wall where shown on Plans Faceplate shall be brass or stainless steel as selected by the Architect.

2.07 MOTION SENSORS

Motion sensors shall be Honeywell DT-7450 with Bosch B328 mounting bracket. Sensors shall be dual performance, dual event devices to minimize false alarms or equal passive infrared devices detecting thermal motion signals. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be adjustable Gimbal mounted with plate and outlet box. Provide an attack resistant enclosure DS AE774 at Multipurpose and Gymnasium areas.

2.08 MAGNETIC SWITCH

Magnetic Switch shall be fully concealed in the door frame, Admeco, Sentrol or equal.

2.09 INTRUSION DETECTION SYSTEM TERMINAL CABINET

Each Intrusion Detection System Terminal Cabinet shall contain a power supply for motion sensors and/or POPIT/POPEX (Zonex) modules.

2.10 CABLING

Cabling shall be as required for system operation. All cabling shall be shielded.

2.11 SIREN

Siren shall be ATW (Mascon) PR-D550PW or equal.

PART 3 EXECUTION

3.01 CONNECTIONS THROUGHOUT THE SYSTEM

All connections throughout the system shall be soldered, crimped by means of AMP lugs, fastened with screw type terminals, made by Spring Tension Clip "punch block" terminals or make by standard plugs and receptacles. Each wire twisted pair, or cable shall be tagged throughout the site with EZ Markers with the room number it serves. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.

3.02 SYSTEM CABLING

All System Cabling shall be installed in conduit except where wiring occurs above accessible ceilings. Wiring not in conduit shall be UL listed plenum-type cable. All wiring in walls shall be in conduit. All conduits shall be run concealed. Where Architecture precludes concealed conduits, run conduits on top of beams or trusses and minimize the exposure to view. Identify on the Submittal Drawings all locations where conduits must run exposed.

3.03 MOTION SENSORS

Locate motion sensors to provide optimum coverage of the space and to avoid conflicts with the Architectural Aesthetics of the building. Submittal Drawings shall show the exact locations of all system sensors and keypads for approval by District's Maintenance Managers.

3.04 DOOR SWITCH INSTALLATION

Coordinate concealed door switch installations with Finish Hardware Manufacturer.

3.05 SYSTEM PROGRAMMING

Provide all system programming as required by the District's Maintenance Managers, including the necessary product handlers, so that all parameters are entered into the system and the annunciator displays a text, which is customized to the facility.

3.06 SYSTEM TESTING AND DOCUMENTATION

A. Before the Contract shall be considered complete, the Contractor shall program the system per District Requirements and demonstrate the performance of the system in the presence of the District. The Contractor shall provide all test and reception gear required to prove the performance as outlined.

B. Actuate Motion Sensing Devices and Verify that the system performs as specified.

C. The Communication Loops shall be opened in at least two locations per building to check for the presence of correct supervisory circuitry.

D. When the Testing has been completed to the satisfaction of both Contractor's Job Foreman and the Representatives of the Manufacturer and the DSA Inspector, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be provided by the Contractor and forwarded to the Architect.

3.07 SYSTEM TRAINING

Provide a minimum of two 4-hour periods to instruct District Personnel in proper operation of all systems. The first instructional period shall be held prior to final acceptance of the systems. Instructional training shall be done at the Project Site and shall be conducted by Factory-Trained Technical Personnel. Furnish the District with videotape VHS cassette(s) of the first instruction session. The second instructional period shall be within a period of 1-year after final acceptance of the systems, upon request of the District.

END OF SECTION 28 31 00

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SECTION 28 46 21

DIGITAL ADDRESSABLE FIRE ALARM AND VOICE EVACUATION SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment 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 Specifications Sections and Drawings for related work required to be included as work under Division 26, 27 and 28.
2. General Provisions and Requirements for electrical work.

B. This Specification provides the Minimum Requirements for the Fire Alarm and Detection System. The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:

1. Smoke and fire detection.
2. Off-premise notification.
3. Mass Notification system.
4. One-way voice communication notification system.
5. Two-way voice communication system.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit eight copies of the following to the Architect for approval.

1. A listing of all fire alarm components and equipment including the California State Fire Marshal (CSFM) listing numbers.
2. CSFM listing sheets of all devices being used.
3. Manufacturers' standard catalog data for fire alarm components.
    a. The submittal shall be arranged in the order of the Specification and shall list the Specification paragraph number, the name, the proposed model and Manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure.
    b. The Manufacturers' data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of item. The data sheet shall completely describe the proposed item.
    c. Where modification to the equipment is necessary to meet the Operational Requirements of the Contract Documents and the data sheets shall include complete Mechanical and Electrical Shop Drawings detailing the modification.

4. A listing of the outlet rough-in needed for every device and equipment item. The applicable symbol which illustrates that rough-in item on the Job Plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by Field Personnel.
5. Elevation and dimensional information.

1.03 APPLICABLE STANDARDS

A. The Equipment shall be listed, labeled, and approved for the application shown in Contract Documents, as fire alarm equipment complying with the Following Requirements:

1. List of applicable Codes:
   a. Building Standards Administrative Code, Part 1, Title 24 C.C.R.
   b. California Building Code (CBC), Part 2, Title 24 C.C.R.
   c. California Electrical Code (CEC), Part 3, Title 24 C.C.R.
   d. California Mechanical Code (CMC), Part 4, Title 24 C.C.R.
   e. California Plumbing Code (CPC), Part 5, Title 24 C.C.R.
   f. California Fire Code (CFC), Part 9, Title 24, C.C.R.
   g. California Referenced Standards Code, Part 12, Title 24, C.C.R.
   h. Title 19, C.C.R., Public Safety, State Fire Marshal Regulations.
   i. California Energy Code (CEC, Part 6, Title 24 C.C.R.
2. NFPA Standards and Guides:
   a. NFPA 13, Automatic Sprinkler Systems.
   b. NFPA 14, Standpipes Systems.
   c. NFPA 14, Dry Chemical Extinguishing Systems.
   d. NFPA 17A, Wet Chemical Systems.
   e. NFPA 24, Private Fire Mains, (included in NFPA 13).
   f. NFPA 72, National Fire Alarm Code, (California Amended).
   g. NFPA 253 Critical Radiant Flux of Floor Covering Systems.
   h. NFPA 2001, Clean Agent Fire Extinguishing Systems.
3. The fire alarm system shall conform to the applicable Standards and Guides referenced in CBC Chapter 60.

B. Written Certification by the Fire Alarm Equipment Manufacturer shall be submitted to the Architect, stating that the system and its component parts are listed and approved by the California State Fire Marshal and the installation has been tested, is operational and conforms to the Requirements as set forth in Part 3, Article 24, Title 19, California Code of Regulations.

1.04 EQUIPMENT AND INSTALLING QUALIFICATIONS

A. The Equipment shall be manufactured by Notifier to match existing fire alarm equipment on the Campus.

B. The Specification is based on the Equipment of Manufacturers who have been approved by the District and the Manufacturers herein named shall be considered as meeting the Requirements of this Specification. For all items which are identified by part number and Manufacturer the Performance Specifications which are published in the most recent

Manufacturer's data sheets available at the time of bidding this Project shall be applicable to the present work as though fully written out herein.

C. All Equipment shall conform to all local applicable Codes and Ordinances and shall be listed by Underwriters Laboratories.

D. To qualify as an acceptable Bidder, whether the bid is submitted to the District, his Agent, a General Contractor or a Sub-Contractor, the System Bidder or Contractor shall be Qualified Fire Alarm Contractor and shall hold a valid C10 License issued by the Contractors State License Board of California. The System Bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted Authorities Having Jurisdiction over the work. The Contractor shall be the Factory Authorized Distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least 5-years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

E. Installation Certification

1. Work and material for cables, cable terminations and related components shall be performed by Certified Installers. The Installer shall be certified by the respective Product Manufacturers.
2. The Manufacturers of the indicated work and material shall provide an Installer Education/Training and Certification Program for the supplied products.
3. The Installers performing the Contract Work for the indicated products shall have attended and successfully completed each of the respective Manufacturer's installation training education programs for the specified products.
4. Submit six copies of the Manufacturer's Certifications for each Installer performing the work. The submittal shall be approved prior to initiating any related Contract Work.
5. Contract Material Installed, and work performed by Installers not complying with these Requirements shall be removed. Removal of work and material not in compliance with these Requirements shall done at the Contractors' expense, without any additional cost to the Contract and without any additional Contract completion due date extensions. New material and work required to replace the non-compiling removed work and material shall be provided at the Contractors' expense, without any additional cost to the Contract and without any additional Contract completion due date extensions.

PART 2 PRODUCTS

2.01 GENERAL SYSTEM OPERATION

A. System shall be microprocessor-based, addressable, and power-limited with Class B supervised circuits, one-way and two-way emergency audio communications.

1. The microprocessor shall execute all supervisory and control programming to detect, report the failure or disconnection of any system module or peripheral device and

initiate programmed control sequences. An isolated supervision "watchdog" circuit shall monitor the microprocessor and, upon failure, shall activate the system trouble circuits.

2. The automatic fire detection and alarm system shall consist of main control panel, transponder panel(s), notification alarm devices, remote annunciator, automatic detection devices, manual stations, printer, and CRT/keyboard, installed and wired in accordance with the Drawings and shall function as specified herein.
3. The system shall be programmable in the field, by a non-computer-trained person. All programmed information shall be stored in non-volatile memory.
4. The system shall operate both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, water-flow switches, and external control modules.
5. The control panel shall provide power, announcement, supervision and control for the fire detection and alarm system. The system shall be designed such that alarm indications override trouble and control conditions.
6. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only 2-wires shall be used from the control panel to each loop of initiating devices and 2-wires for the notification alarm devices). These two wires shall provide both supervision and notification alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision may be provided by adding an additional pair of wires.

B. Alarm Conditions

1. Actuation of any manual or automatic alarm initiating device, connected to the system shall cause the following automatic functions.
   a. All notification alarm signaling units shall activate continuously. Audible notification alarms shall sound the California State Coded Signal.
   b. The respective zone alarm lamp or annunciator alphanumeric readout on the central control panel, and remote annunciator panel, shall be activated.
   c. Activate the Digital Alarm Communicator system.
2. Actuation of HVAC air duct smoke detectors shall stop the designated fans and motors in the building's air distribution system.
3. Actuation of smoke detectors on either side of smoke doors shall energize the release mechanism on the smoke door causing the door to close.
4. Notification alarm signal duration shall be capable of continuous sounding or adjustable from three to 10-minutes.
5. Perform any additional functions as specified herein or shown on the Drawings.

C. Trouble Condition

1. A single open or single trouble condition in a manual or automatic fire initiating wiring circuit shall activate the respective zone trouble lamp or annunciator readout on the fire alarm control panel and sound a trouble signal at the control panel.
2. A single open or single trouble condition in the notification alarm signaling wiring circuit shall activate the trouble lamp or annunciator readout in the control panel and sound a trouble signal at the control panel.

3. 120-volt AC normal power shall be monitored with indication by a "power on" lamp. Upon normal power outage, the system shall activate power trouble condition lamp or annunciator readout and indicate a trouble condition.
4. The control panel shall monitor the standby batteries and, upon a low battery condition, activate the low battery lamp or annunciator readout and indicate a trouble condition.
5. System ground detection shall be provided for the entire system. Upon ground detection, activate the ground detection lamp or annunciator readout and indicate a trouble condition.

D. Control Panels Employing Alphanumeric Readouts shall display the troubled condition along with a prompt to review the list chronologically. The end of the list shall be indicated.

2.02 FIRE ALARM CONTROL PANEL

A. General

1. The fire alarm control panel shall be software programmable, microprocessor controlled, solid state, electronic integrated system. The panel shall be the product of one Manufacturer. The control panel shall provide power, announcement, supervision and control for the detection and alarm system. The detection system shall remain 100% operational, responding to alarm condition while in the routine maintenance mode.
2. Addressable detection and control devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm and any quantity of addressable control units shall be operable at any time up to the total number connected to the system.
3. The microprocessor shall access the system program, which is stored in non-volatile programmable memory, for all Control-by-Event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Volatile memory shall not be acceptable.
4. A means shall be provided for acknowledging each abnormal condition. Each activation of the appropriate acknowledgement button shall sequentially acknowledge every point in the system. After all the points have been acknowledged, the LEDs shall glow steady, and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be so indicated.
5. An alphanumeric annunciator readout shall indicate on the control panel the activation by type, loop, and address of the specific device, sub-loop or alarm/ monitor/control point via an alphanumeric display. An audible alert shall sound at the control panel and an alarm light shall flash.
6. If the microprocessor fails, the system shall execute a default signaling program. This program shall enable the control panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the communication loop where-in the alarm originated. Inability of the system to sound signals or summon the Fire Department during microprocessor failure shall not be acceptable.

7. Protected access to the system controls shall be provided to allow the user/operator access to the following system functions:
    a. Status of all addressable points.
    b. Status of all events logged.
    c. Set/change the real-time clock and date.
    d. Perform an operational manual test of the system from the control panel, including actuation of any initiating device and trouble circuit without alarming the remote central station. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.
    e. Retrieve from event log the last 300 alarms, or control points and 300 trouble conditions.
8. Individual input (monitor) and output (control) device addressability shall all be performed on the same pair of wires. Wiring shall be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision.
9. A minimum of 25% addressable monitor, trouble and control points shall be provided.

B. Cabinet
1. A metal tamper resistant cabinet shall contain the control panel components. Panel shall be surface or flush mounting as indicated on the Drawings. Provide a full height tamper resistant hinged locking cabinet door. The door shall have transparent, high impact windows to allow visual observation of all indicators and switches without opening the panel door.
2. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
3. All groups of circuits or common equipment shall be clearly marked and shall be expandable by inserting interchangeable units.

C. The Control Panel shall provide positive protection against the fire alarm system inadvertently being left in a non-operating status. The alarm system shall automatically restore and resound alarms and trouble signals, if subsequent alarm initiating or trouble signals are received under any of the following conditions:
1. After the alarm or trouble silence switch have been activated.
2. Prior to resetting system after previous alarm or trouble conditions.

D. The System Indicating and Operational Control Devices shall be mounted on the control panel face behind the panel door and shall provide the following minimum functions:
1. Individual visual indicating pilot lights announcer or alphanumeric readout to monitor the following alarm system conditions:
    a. Input power.
    b. System common alarm.
    c. System common trouble.
    d. Alarm or trouble signal silenced.
    e. Ground fault.

f. Battery condition.
g. Each individual alarm, control or initiating zone-activation.
h. Each individual alarm, control or notification zone-trouble.
i. Report, by specific device number, any device removed from an addressable initiating circuit, all other devices shall continue to function.

2. Manual control switches to allow the following system controls:
a. Alarm silence.
b. Trouble silence.
c. Test all indicating pilot lights and readouts.
d. System reset, including remote devices connected to the alarm panel.
e. Alarm test to initiate an alarm condition from the control panel.
f. Alarm disconnect for system testing without activating the Digital Alarm Communicator system.
g. Changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.
h. Perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

E. Alarm Initiating Zone Modules.
1. Shall supervise and accept remote alarm actuating device input signals. An alphanumeric readout shall indicate separate zone alarm and trouble indicators for each zone.
2. Zones shall be compatible and designed to operate with the connected initiating devices either addressable or non-addressable type.
3. A spare double-throw set of software programmable auxiliary alarm relay contacts shall be provided for control of remote devices for each zone. Contacts shall be rated 120-volt 60Hz 3 Ampere.
4. Each device on the system shall report as its own unique address.

F. Notification Alarm Signal Control.
1. Shall supervise and activate remote notification alarm devices.
2. Notification alarm shall be compatible and designed to properly operate with the connected audio and visual notification alarm devices, with no signal degradation.
3. The notification alarm shall provide group notification signal control of all notification zones.
4. The alarm modules shall be field resettable to provide either continuous or Coded Notification Alarm Signals. The Coded Alarm Signal shall provide an intermittent "on-off" pulsed sound activation of audible notification alarm devices.
5. A notification alarm circuit trouble indicating readout shall be provided for each notification zone.

G. Audio

The System shall be capable of delivering multi-channel audio messages simultaneously over copper and/or fiber media. All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store pre-recorded audio messages digitally. These messages shall be automatically directed to various areas in a facility under program control. The system shall support remote cabinets with zoned amplifiers to receive, amplify and send messages through speakers over supervised circuits. The one-way emergency audio control shall provide control switches to direct paging messages as follows:

"All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.

"Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.

"Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.

"Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.

"Page by Phone" switch to select the Fire Fighter's telephone system as the source for paging.

The System shall be capable of delivering multiple audio messages simultaneously over copper and/or fiber media. All audio messages and live pages shall originate at the one-way emergency audio control unit. The one-way emergency audio control unit shall store pre-recorded audio messages digitally. These messages shall automatically directed to various areas in a facility under program control. The system shall support remote panels with zoned amplifiers to receive, amplify, and distribute messages through speakers over supervised circuits.

The two-way voice communications control unit shall provide two-way communications between remotely located phones and the Command Center. The control unit shall provide the ability to individually select and display each two-way voice communication circuit support up to five remote telephones in simultaneous two-way voice communications.

Audio Amplifiers (Multi-Channel)

Provide one 20-watt audio amplifier per paging zone. There will be a total of two 20-watt amplifiers (one per floor). The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall automatically provide a local 3-3-3 1000Hz temporal pattern output upon loss of the audio communications with the one-way audio control unit, during an alarm condition. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall include a dedicated, selectable 25/70 Vrms output. Provide a standby audio amplifier that will automatically sense the failure of a primary amplifier and replace the function of the failed amplifier.

H. Automatic Ground Detection shall detect either positive or negative voltages when earth connections of 50,000 OHMS or less occur and activate the ground trouble signal.

1. A ground fault Code shall provide indication of either a positive or negative ground fault and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.

2. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored for short circuits and shall have a distinctive error message for visual indication of circuits and operating trouble devices as specified herein but shall not cause an alarm to be sounded.

I. Power Supply

1. The dedicated power supply shall be adequately sized to properly operate the equipment, including remotely connected, spare and future indicated equipment with all alarm devices in alarm condition. Provide 20% spare power supply capacity for future expansion. Provide transfer modules and multiple power supplies as required for proper operation.
2. Input voltage 120/240 volt or 120/208-volt 60Hz AC.
3. Surge transient voltage protection on the input and output phases of the power supply shall be provided.
4. Supervised voltage types (i.e., 120-volt 60Hz AC, 24-volt AC, 24-volt D.C., etc.) required by special connected equipment shall be supplied, including but not limited to:
   a. Alarm initiating devices.
   b. Notification alarm devices.
   c. Control and annunciator panels.
   d. Fire and smoke dampers.
5. A solid-state power transfer circuit shall provide (UPS) Uninterrupted Power Supply between internal standby power and line power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
6. Individual circuit fuses shall be provided for smoke alarm detector power, main power supply notification circuits, battery standby power, and auxiliary output.
7. Provide lock-on device on each power supply dedicated branch circuit breaker at panel.

J. Battery Back-Up Operation

1. Internal batteries and battery power supplies shall be provided to allow 60-hours continuous automatic normal operation of the entire control panel and fire alarm system after the failure of the incoming utility power. Sufficient battery capacity shall remain at the end of 60-hour period to provide ten minutes of continuous operation of all connected notification alarm devices.
2. Batteries shall be maintenance free, sealed, lead-acid or lead calcium or gelled electrolyte type rated 25% larger than required to provide power for the entire system upon loss of normal 120 VAC power for a period of 60-hours with 15-minutes of alarm signaling at the end of this 60-hour period.
3. The battery charger shall be automatic, dual rate with capacity to recharge completely discharged batteries in 18-hours. Charger shall be temperature compensated.

K. Lightning and Transient Voltage Surge Protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.

L. Circuitry shall be provided in the control panel to permit transmission of trouble and alarm signals over leased or privately owned telephone cables to a remote receiving panel. A

reverse polarity or a master box circuit as required shall be provided in the control panel. There shall be a supervised disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.

M. The Alphanumeric Annunciator (printer and CRT/keyboard) shall list upon request:
   1. Alarms with time, date and location.
   2. Troubles with time, date and location.
   3. Status of output functions, "on" or "off".
   4. Sensitivity of addressable smoke detectors.
   5. Detection device number, type and location.
   6. Status of remote relays, "on" or "off".
   7. Acknowledgment time and date.
   8. Signal silence time and date.
   9. Reset time and date.

N. The System shall also provide the following:
   1. Counting the number of addressable detectors within a "zone".
   2. Which are in alarm.
   3. Counting "zones" which are in alarm.
   4. Counting the number of addressable detectors which are in alarm.
   5. Alarm on the system.
   6. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.
   7. Assigning priorities to types of detectors, zones or groups of detectors.
   8. Cross-zoning.

O. Control Functions
   1. Control functions shall be assigned on the basis of multi-relational system initiation patterns of detection devices including full logic element equations using as "anding" zones, counting zones, counting devices, "anding" groups, conditional "if", "then", "or" programming and "anding" types of detection devices.
   2. Control functions shall be assigned on the basis of, cycle, delay, count, time of day, day of week, day of month and with a holiday schedule of up to 30-holidays per year. Each addressable detection device shall report its condition to the system control unit not less than every 4-seconds in a manner such that failure of the connections to the internal electronics of the device will result in a trouble signal which identifies the specific device involved.
   3. The system shall be field programmable for the response of control points to monitored devices.
   4. The operating software program shall provide programmable control for the Event-Initiated-Programs (E.I.P.) which shall allow automatic operation of system control points in the event of an alarm condition. To program this E.I.P.s, the system shall use a

specifically designed user friendly programming language, which shall not require a knowledge of computer programming to learn and understand.

5. The operating software shall support the following additional capabilities:
   a. Three levels of designated and unique Priority Alarms for each point.
   b. Designated "Sense Mode" for status interpretation for each point.
   c. Designated Print/No Print/Vectoring Mode for each point.
6. The input statement defines the conditions required to activate the associated output statement. The input statement shall consist of single or multiple monitor point status, subroutine status, time comparison and the utilization of AND, OR, NOT, COUNT, and DELAY logic functions.
7. The output statement defines the action to be taken by the control panel. The output statement shall consist of activation/deactivation of single or multiple control functions, subroutines, and remote Annunciator status LED's. Output statements shall also include the "Alert" messages.
8. The software shall provide an "alert" message, unique to each point in the system, which will provide specific instructions for the operator on duty. These messages shall be up to five lines with up to 70-characters in each line. Each system monitor point shall have five specific alert messages when in alarm. Control points shall also be assigned alert messages.
9. The hardware and software shall have the capacity to accept up to 64-independent programs. Each program shall have "Edit" or "No Edit" capability. Each program shall be written in an equation format comparable to ladder-logic equations. The Equations shall consist of an input and an output statement.
10. Provide initial programming services for coding, loading and debugging the initial District specified programs, as part of the Contract.
11. Programming Command Definition
    a. Timing command shall provide time delay and time control functions based on internal clock/calendar by time of day; day of week; day of month; month in year.
    b. Count command shall provide a specific number of events to occur before a control action is initiated.
    c. Pulse command shall provide on control for a specific period of time.
    d. Cycle command shall provide on-off control for preset periods of time.
    e. Print command shall provide printing of specified information after an event occurs.

2.03 FIRE ALARM DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Enclosure shall be red.

B. Panel shall be solid state with eight zones for off-premise monitoring of the fire alarm control panel.

C. System shall monitor alarm and trouble conditions. System shall be power limited.

D. System shall include dual telephone line switcher for central station reporting. Telephone lines shall be supervised.

E. System shall include dual battery harness, batteries, and battery charger.

F. System shall be UL listed for central station fire signaling systems (NFPA 71).

G. System shall be California State Fire Marshal approved for central station reporting.

H. System shall be Farenhyt Series. System shall be approved for connection to the fire alarm control panel.

I. Verify Specific Requirements with District and Central Station prior to submittals.

2.04 MANUALLY ACTIVATED ALARM INITIATING DEVICES

Manual Fire Alarm Boxes shall comply with CBC Sections 11B-309 and 11B-403.

A. An Electronic, Digital Multiplex, Addressable Module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address Code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Devices shall be suitable for use on Class "B", 2-wire supervised alarm initiating circuit.

C. Numbered Screw Type Terminals shall be provided for "in-out" connections of the alarm circuit wiring.

D. The Face of the Station shall have lettering indicating "FIRE" and operational instructions. Stations shall be tamper resistant, semi-flush mounting.

E. Auxiliary Spare Switch Contact shall be provided for control of remote devices rated 120 volts - 60Hz, AC - 3AMP minimum.

F. Stations shall provide visual indication the station has been activated. A key (and/or special tool) shall be required to gain access into the station to reset the station after being activated.

G. Stations shall be "Non-breakable-Glass" type.

H. RF and Transient Filtering shall be provided in the device electronics.

I. Pull Stations shall be non-coded double action, requiring a two District manual "pulling" actions to initiate the fire alarm system.

J. Stations Installed Outdoors shall be weather resistant construction, double action to activate the pull station.

2.05 AUTOMATIC ALARM INITIATING DEVICES

A. General

1. An electronic digital, multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

2. Devices shall be suitable for use on Class "B", 2-wire supervised alarm initiating circuit. Where initiating devices are shown connected to an existing system, devices shall operate on 2 or 4-wire circuits plus, 2-wire power circuit as required by the existing equipment.

3. Numbered screw type terminals shall be provided for "in-out" connectors of the alarm circuit wiring.

4. Auxiliary double throw spare relay contact shall be provided for activation of remote rated devices 120-volt 60Hz, AC, 1-amp minimum.
5. RF and transient filtering shall be provided in the initiating device electronics.
6. Initiating devices shall be reset from the control panel and shall not require individual resetting.

B. Smoke Detector

1. Detectors shall comply with UL standard 268, 167 and 168, and shall use solid state electronic circuits throughout.
2. The smoke detector shall operate on a total of two circuit wires. Alarm signaling and detector power shall use the same conductors. Detector sensitivity shall be factory set at 1.5%. Provide testing provisions in accordance with CFC 907.9.3 – 907.9.4.1, NFPA72.
3. A fine mesh insect screen shall be provided on all detector openings.
4. The detector shall lock-in on alarm and shall provide a visual alarm/trouble indicator light. An electromechanical test feature shall provide functional testing of the unit without smoke.
5. The detector shall also incorporate a fixed temperature heat detector rated at 135 degrees F. The heat detector shall operate the alarm circuit and alarm/ trouble light.
   a. Photo electric type smoke detectors shall employ a Light Emitting Diode (LED) as the detector light source, activated by the presence of combustion smoke products. Failure of the LED shall activate the alarm/trouble light on the detector.
   b. Ionization type smoke detector shall employ the triple chamber (dual chamber) ionization principle, activated by the presence of combustion products. The ionization chamber shall be RF shielded.
   c. Air duct smoke detector photo electric or ionization type for installation on a mechanical air duct. Two air tubes shall extend into the air duct. The sampling tube shall extend across the entire width of the air duct. The second tube shall allow air to escape back into the duct.

C. Fire Detector - Heat

1. Heat detectors shall be dual action electro-thermostatic combination rate of temperature rise and fixed temperature operation. An indicator shall be visible when detector has activated.
2. The rate of rise element shall be self-restoring, after activation.
3. The fixed temperature unit shall be set at 136 degrees F (190 degrees F for high temperature areas i.e. over 110 degrees F).
4. Provide a wire guard cover for the detector.

2.06 NOTIFICATION ALARM DEVICES

A. General

1. Notification alarm devices shall activate automatically from the control panel. Devices shall operate on a Class "B" (Style Y), 2-wire supervised alarm notification circuit. Series wired alarm devices shall not be used.

2. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
3. Devices shall be installed in a box, 3½-inches deep maximum, flush mounting unless indicated otherwise on the Drawings. Size as required for the alarm indicating device and wiring connections. Provide a trim ring and metal grill cover assembly. Cover assembly shall be a minimum of 1/16-inch minimum thick flat stainless steel or aluminum. Finish color as selected by Architect. The word "fire" shall appear on the grill minimum ½-inch letters. The grill shall be attached with screws to the box.
4. Each audible notification visual device shall incorporate a visual alarm indicator. The visual alarm indicating device shall be an integral part of the audible alarm box assembly.
5. Audible notification device and visual notification devices shall be connected to separate notification alarm signal circuits. Do not connect these devices to the same circuit conductors.

B. Notification Appliances

1. Speakers

   Low Profile Speaker

   Provide low profile wall mount speakers at the locations shown on the Drawings. The low-profile speaker shall not extend more than 1-inch (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), ½W (84dBA), or ¼W (81dBA) at 10 feet when measured in reverberation room per UL-464.

   Wattage setting shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low-profile speaker shall mount in a North American 4-inches x 2⅛-inches square electrical box, without trims or extension rings.

2. Speaker-Ceiling Mount-8in

   Provide 8-inches ceiling mounted speakers at the locations shown on the Drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square steel with white finish as required. Provide square surface mount boxes with matching finish where required. Speakers shall provide ½w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4-watt setting, the speaker shall provide a 94-dBA sound output a frequency of 1000Hz when measured in an anechoic chamber at 10 feet.

3. Speaker-Cone-4in

   Provide 4-inches white speakers at the locations shown on the Drawings. Speakers shall have a 4-inch Mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide ¼w, ½w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2-watt setting, the speaker shall provide a 90-dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480.

4. Speaker-Reentrant Surface

   Provide 4-inch surface re-entrant speakers at the locations shown on the Drawings. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize high-efficiency compression drivers. Cone type drivers are not acceptable. At the 15-watt setting, the speaker shall provide a 102dBA sound output over a frequency range of 400-4000 Hz when measured in reverberation room per UL-1480. Weatherproof boxes shall be provided for outdoor mounting.

5. Speaker-Strobes

   Low Profile Speaker-Strobe

   Provide low profile wall mount speaker/strobes at the locations shown on the Drawings. The low-profile speaker/strobe shall not extend more than 1-inch (2.5cm) past the finished wall surface and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), ½W (84dBA), or ¼W (81dBA) at 10 feet when measured in reverberation room per UL-464.

   Strobes shall provide synchronized flash output that shall be switch selectable for output values of 15cd, 30cd, 75cd and 110cd. Wattage and candela settings shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low-profile speaker/strobes shall mount in a North American 4-inches x 2⅛-inches square electrical box, without trims or extension rings.

6. Speaker-Strobe 4in

   Provide 4-inches red speakers/strobes at the locations shown on the Drawings. Speakers shall have a 4-inches Mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide ¼w, ½w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2-watt setting, the speaker shall provide an 87dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15/75cd, 30cd, and 110cd devices.

7. Speaker-Strobe Ceiling 8in

   Provide 8-inches ceiling mounted speaker/strobes at the locations shown on the Drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square, steel with white finish as required. Provide square surface mount boxes with matching white finish as required. Speakers shall provide ½w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4-watt setting, the speaker shall provide a 94dBA sound output a frequency of 1000Hz when measured in an anechoic chamber at 10 feet. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

8. Speaker-Strobe Re-entrant

   Provide 4-inch red re-entrant speaker/strobes at the locations shown on the Drawings. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w,

4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize high-efficiency compression drivers. Cone type drivers are not acceptable. At the 15-watt setting, the speaker shall provide a 102dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

C. Visual Alarm Indicator

1. Lamp/Strobe internally illuminated projecting lens assembly, with flasher system. Unit shall flash on and off to provide visual indicating of fire alarm.
2. The word "fire" shall appear on the lens or lens plate.
3. Flash rate, one flash per second, with a flash duration of approximately 0.001 second, flash rate independent of audible device.
4. Light source, Xenon high intensity flash strobe tube white/clear color.
5. Strobe shall have a minimum output of 75 candelas with a maximum flash intensity of 120 candelas.
6. Strobe shall comply with NFPA Requirements.

2.07 REMOTE FIRE ALARM ANNUNCIATOR

A. General

1. The annunciator panel shall be powered and operated from the fire alarm control panel. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
2. A metal tamper resistant weatherproof cabinet shall contain the annunciator components. The panel shall be surface or flush mounted as indicated on the Drawings. Provide a full-height tamper resistant, hinged locking cabinet door. Door shall have transparent high impact windows to allow visual observation of all indicators and switches.
3. An electronic digital, multiplex, addressable module shall be incorporated into the annunciator. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Each Alarm Initiating Zone (including spares) shall be individually annunciated in the annunciator panel.

C. A Common Fire Trouble Alarm shall be announced in the annunciator panel from the fire alarm control panel.

D. Annunciator Lamp Circuits shall be automatically supervised. Provide lamp test switch in the annunciator panel.

E. An Audible Alarm/Trouble Buzzer with silence switch and automatic resound for subsequent alarm/trouble signals shall be provided. The annunciator panel shall be automatically reset when the control panel is reset.

F. A Keyed Switch shall be provided for remote reset of the system. The annunciation panel shall also be automatically reset when the control panel is reset.

G. Provide a Floor Plan of the facility framed under acrylic and mounted adjacent to the fire alarm annunciator. The Floor Plan shall be to scale and shall have room numbers clearly displayed on all rooms corresponding to the annunciator for the purpose of easily identifying the fire zones.

2.08 REMOTE EQUIPMENT MONITORING AND CONTROL

A. An Electronic Digital Multiplex Addressable Module shall be provided at each device or equipment indicated to be controlled by the multiplex system. Multiple addressable control ports shall be provided in each module quantity as required for each point controlled or monitored. The module shall communicate the monitor status control action and trouble condition of each device with a unique address Code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Where Multiple Points are Monitored or Controlled, Provide Digital, Multiplex, Multi-points, Monitor, Control Panel (MMCP). The panel cabinet shall be self-contained NEMA 1 construction and hinged locking door. Provide tamper switch detection zone on the cabinet door; provide 60-hour battery UPS backup and power supply, the same as required for the fire alarm control panel. Panel shall be expandable using plug-in circuit monitor/control printed circuit cards. Provide barriered numbered terminal strips.

C. Each Control Point shall provide a supervised "dry" relay contact single pole double throw-maintained contact rated 10 ampere, 227 volt, 60Hz AC.

D. Each Monitor Point shall provide not less than one of the following supervised methods of monitoring a remote device or equipment action or status.

1. Remote "dry" contact operation normal open, normally closed or momentary contact operation.

PART 3 EXECUTION

3.01 IDENTIFICATION

A. The Inside Cover of Alarm Initiating Devices shall be marked with the zone initiating number corresponding to the zone number in the control panel. Marking shall be with a felt-tip pen.

B. Each Fire Alarm Terminal Cabinet shall be painted red.

C. Provide Nameplate: “Power to Main Fire Alarm Control Panel" screwed onto the branch circuit overcurrent device supplying power to the main fire alarm control panel.

3.02 WIRING

A. Review the Total System Point-to-Point Wiring layout to assure that the correct number and type of wires and conduit sizes are installed.

B. Final Connections, Testing, Adjusting and Calibration shall be made under the direct super-vision of a Factory-Trained Technician of the System Supplier.

C. All Wiring shall be in conduit.

D. All Wiring in Cabinets shall be neatly formed, laced and made up on bolt and nut terminal blocks. Tag all spare conductors. All conductors shall terminate on terminal strips with spade lugs, of adequate size for all incoming and outgoing conductors. The strips shall be labeled as

to their use and wiring diagram shall be placed on the cabinet door showing connections of all related equipment to these strips.

E. Wiring Requirements for shielding certain conductors shall be as recommended by the Manufacturer. Provide all conduit, raceways and conductors per Manufacturers recommendations and include all material and labor costs in the Contract Price.

F. The Conductors used for digital, multiplex communication between the fire alarm control panel and external remote initiation devices, control points and annunciators, shall be twisted, shielded, multi-conductor cable, #16AWG copper minimum with a separate internal ground/ drain conductor, UL listed for fire alarm system use. One spare pair of multiplex conductors shall be provided in all main and branch device/equipment connections for future system use. "Tees" and taps at any junction box location in the communication lines, shall be permitted by the system to additional devices without affecting proper system operation.

G. Wire Size: Wire shall be sized to insure installed circuit voltage drop does not exceed 10% to all devices.

3.03 OUTLET BOXES

Device outlet boxes shall be flush mounted unless indicated otherwise on the Drawings. Provide extension rings to finish flush with finish surface. Where the Drawings indicate surface mounted devices, outlet boxes shall be cast metal with threaded hubs. Where the conduit entrances are not exposed for surface mounted devices, provide flush outlet box behind the device box, and omit the conduit hubs on the device box. Size device boxes and outlet boxes per Manufacturer's recommendation and as required by Code for wire fills.

3.04 SPECIAL INSTALLATION REQUIREMENTS

A. Air Duct Smoke Detectors shall be installed in the supply air ducts and return air ducts with an air flow of 2000 CFM or greater, coordinate with Mechanical Contractor. Sampling tube shall extend across entire duct width. Provide ¾-inch conduit with 2#12 to respective motor control device to automatically shut down the respective fan motor upon detection of smoke in the air duct. Installation shall be in compliance with CMC 606.8.

B. Water Flow Switches shall be installed on each main fire sprinkler rise pipe, coordinate with the Fire Sprinkler Contractor.

C. Tamper Switches shall be installed on each main fire sprinkler shut-off valve, coordinate with the Fire Sprinkler Contractor.

D. Equipment shall be weatherproof gasketed where installed in locations exterior to the building or where indicated on the Drawings. Weatherproof equipment shall be tamper resistant.

E. Provide Clear Vandal Resistant Protective Cover for all audio-visual devices located in student restrooms and public hallways.

F. Provide Wire Guard for Ceiling mounted smoke and heat detectors located in student rest-rooms.

G. Connect Fire Alarm Control Panel with Security/intrusion control panel for monitoring by Remote Monitoring Company.

H. Connect Fire Alarm Control Panel with Master Clock System to turn off class passing schedule, with paging system to turn off system when fire alarm system in alarm condition.

I. Conduit with Fire Alarm Wiring shall be painted red.

J. Fire Alarm System shall be programmed per actual building and room designation. Submit printout for review.

3.05 TESTING

A. The Entire Fire Alarm System shall be tested in the presence of the Local DSA Inspector and a Representative of the Manufacturer after the installation is complete.

1. Individually activate each manual initiating station and verify correct alarm operation and control panel response.
2. Individually test each automatic initiating device and verify correct alarm operation, control panel response and remote equipment operation.
3. The communication loops and the notification alarm circuits shall be opened in at least two locations per building to check for the presence of correct supervisory circuitry.

B. Test the Battery Back-up System by disconnecting the incoming normal power and allowing this alarm system to operate 24 hours on battery power. Sound the alarm system for 5-minutes at the end of 24 hours on battery power.

C. Perform all Electrical and Mechanical Tests required by the Equipment Manufacturer's Certification form. Measure and adjust each automatic detection detector to the maximum stable sensitivity setting. Detector tests shall be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. An operational check-out test and report shall be performed. Submit six copies of test report results. The tests and report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that all equipment is properly installed and functions and conforms with these Specifications.
3. Test of individual zones as applicable.
4. Serial numbers of locations by zone and model number for each installed detector.
5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
6. Technician's name, certificate number and date.
7. The completed manual and automatic monitoring and control system shall be tested to ensure that it is operating properly. This test will consist of exposing the installed units to a standard fire test.
8. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90-day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the equipment and detector(s) and begin another 90-day test period. As required by the Architect, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the District has obtained beneficial use of the building under tests.

D. After the Testing has been completed to the satisfaction of CFC 907.9 – 907.9.4.1 the Inspectors, provide the NFPA Certificate of compliance to the District, the Local Fire Official, the Architect and DSA.

E. Upon receipt of Certificate of Compliance, the Installer/Supplier shall supply the District with written operating, Testing and Maintenance Instructions, Point-To-Point As-Built Drawings, and Equipment Specifications. Maintenance provisions, CFC 907.4.5.

3.06 INSTRUCTIONAL SESSIONS

Provide a 2-hour Instructional Sessions conducted by a Factory-Authorized Technician at the Job Site after completion of all tests to instruct District Personnel on the use of the system. The first session shall be videotaped and conducted prior to final acceptance of the Project. The second session shall be held within 11-months of final acceptance of the Project, when requested by the District.

END OF SECTION 28 46 21

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SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Earth stripping and stockpiling.

D. Repair and restoration.

E. Grubbing of root systems of trees and shrubs, abandoned utility lines and structures and other below grade obstructions and debris.

F. Debris removal.

1.02 RELATED REQUIREMENTS

A. Section 02 41 00 - Demolition: Removal of built elements and utilities.

1. Removal of paving and removal if indicated of abandoned utilities.
2. Sitework (Area of Work), removal of designated fences, walls, and other elements; capping and identifying utilities; landscape paving, and removal of concrete foundations.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning).

C. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction).

D. ANSI A300 Part 6 - Tree, Shrub, and Other Woody Plant Management--Standard Practices (Planting and Transplanting).

E. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene prework meeting one week prior to start of work of this section; require attendance by affected personnel.

B. Sequencing: Ensure utility disconnections are in orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan:

1. Indicate areas for temporary construction and field offices.

C. Clearing Firm Qualification Statement: Documentation of specialized experience.

D. Photographs: Photographic documentation of existing vegetation.

1.06 QUALITY ASSURANCE

A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 FIELD CONDITIONS

A. Ambient Conditions: Terminate work during hazardous environmental conditions according to 29 CFR 1910.266.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sedimentation Barrier: See Section 01 57 23 - Temporary Storm Water Pollution Control.

B. Additional materials shall be at the Contractor's option.

PART 3 EXECUTION

3.01 EXAMINATION

A. Comply with additional requirements specified in Section 01 70 00 - Execution and Closeout Requirements.

B. Identify potential dust sources.

C. Identify preexisting debris, junk, and trash on-site.

3.02 SURVEY STAKING IN UNCLEARED EASEMENTS

A. Flag centerline of utility lines prior to clearing. Contractor shall set offsets for clearing limits to suit the Work.

B. When the clearing is completed, survey for utility construction in accordance with requirements specified in Section 01 70 00 - Execution and Closeout Requirements.

C. Contractor shall replace all controls and stakes damaged or destroyed, at no change in Contract Time or Contract Price.

3.03 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local 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. Protect existing structures and other elements that are to remain.

E. Protect existing vegetation to remain from damage and monitor according to ANSI A300 Part 5.

1. Photograph vegetation with documentation indicating data, time, weather, and brief description of health condition.

F. Develop dust remediation controls and methods. Do not use water if that results in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Remove preexisting debris, junk, and trash on-site.

3.04 DUST CONTROL

A. Refer to requirements of:

1. Section 01 50 00 - Temporary Facilities and Controls.
2. Section 31 22 00 - Grading.

B. Minimize dust during clearing and grubbing to protect adjoining property and vehicles parked in the vicinity.

C. Clean-up: Keep public thoroughfares clear of dust and debris by periodic sweeping and washing down, at least daily at the end of working hours.

3.05 CLEARING AND GRUBBING

A. Perform clearing Work within confines of Project area indicated on Drawings or specified elsewhere herein and with strict adherence to the Contract Documents and Geotechnical recommendations.

B. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.

C. Clear site after relocating vegetation in accordance with ANSI A300 Part 6.

D. Do not remove or damage vegetation beyond limits indicated on drawings.

E. Remove only trees within area to be cleared that have been marked for removal. Confirm trees to be removed with District and Architect before beginning removal process.

1. Cut trunks close and parallel to ground.
2. Remove roots where under or within five feet of proposed structures.

F. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.

G. Grubbing: Remove stumps, roots, buried timber, and other vegetation minimum depth 12 inches (30 cm) from ground. Remove rocks minimum depth 6 inches (15 cm) from ground.

1. At pipelines, remove all trees or stumps within five feet of the pipeline.
2. Perform grubbing where indicated on Drawings or as specified herein. Grubbing shall include removal from the ground of all stumps, roots, buried logs and other vegetation not otherwise indicated to remain, and removal and disposal of resulting refuse.
3. Completely grub areas where unsuitable surface material is to be removed.

3.06 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.

1. Includes trees, stumps, shrubs, downed timber, and other vegetation identified for removal as indicated on drawings.
2. Pull stumps, remove roots, buried timber, and other vegetation identified for removal 12 inches (30 cm), minimum depth, from ground. Remove rocks 6 inches (15 cm), minimum depth, from ground.
3. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and matching existing grade.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

3.07 EARTH STRIPPING AND STOCKPILING

A. Stripping:
1. Cut sod into portable sections for undamaged removal.
2. Record topsoil depth at rate of five measurements per acre or within each identified area as indicated on drawings.
3. Remove topsoil within identified area:
a. According to soil report.

B. Stockpiling:
1. Place sod in identified areas.

3.08 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Trees: Sell if marketable.

C. Sod: Reuse on-site if possible; otherwise sell if marketable.

D. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; give preference to on-site uses.

E. Burial and Burning: Debris shall not be buried or burned on site.

3.09 REPAIR AND RESTORATION

A. Remaining Existing Facilities, Utilities, and Site Features: If damaged due to this work, repair or replace to original condition.

B. Vegetation: Replace damaged or destroyed vegetation identified to remain as indicated on drawings at no cost to District:
1. Outside removal limits.
2. Inside protection limits.

C. Apply tree wound compound according to manufacturer's recommendations.

3.10 DAMAGED VEGETATION

A. Neatly prune damaged branches and severed roots.

B. Apply wound paint to above-ground cuts and abrasions.

C. If trees and shrubs indicated to remain are damaged excessively, as determined by DSA, Architect or authorities having jurisdiction, remove and replace damaged plants with comparable plants.

3.11 DEBRIS REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove logs, rocks and other debris.

C. Dispose of Debris resulting from clearing and thoroughly clean rights-of-way.

D. Leave site in clean condition, ready for subsequent work.

E. Clean up spillage and windblown debris from public and private lands.

F. Hazardous Materials:

1. Immediately notify the Owner Representative should hazardous materials or suspected hazardous materials be encountered.
2. Dispose of such materials in accordance with all applicable laws and regulations and as directed by authorities having jurisdiction.
3. Unforeseen conditions will be resolved in accordance with the Conditions of the Contract.

G. Saleable Materials:

1. Unless otherwise indicated, all felled trees from which merchantable lumber or firewood can be produced shall become the property of the Contractor.
2. Unless otherwise indicated, all metallic debris of salvageable value shall become the property of the Contractor.
3. The Contractor shall remove all saleable materials from the site in a timely manner.
4. Sale of salvaged and merchantable materials shall be done on site only with prior approval of the District.

3.12 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and ready to receive work.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coordinate work of this Section to compliment and coordinate with field conditions and Civil Drawing noted specific referenced requirements. Utilize the most stringent requirements.

B. Rough grading and consolidation/compaction the site for site structures.

1. Preparation for excavation, trenching, backfilling and compacting Work.

C. Fine grading.

D. Excavation of subsoil, stockpiling for later reuse, and removal of excess from the site.

E. Preparing of subgrade for walks, pavements and site retaining walls.

F. Excavating, backfilling and compaction for wet utility lines.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 23 - Fill.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations.

B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1. Accurately record location of all changes in finish elevations and gradients which materially affect drainage.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: For conditions not covered in this Section, refer to applicable provisions of the California Building Code (CBC), Chapter 18A - Soils and Foundations, as amended and adopted by authorities having jurisdiction.

B. Perform Work in accordance with locally adopted {\rs\#1} standards.

1. Maintain one copy on-site.

1.06 FIELD CONDITIONS

A. Ambient Conditions: Terminate work during hazardous environmental conditions in accordance with 29 CFR 1910.266.

B. Existing Conditions: See site and utility survey, existing conditions survey, and site drawing; see Section 00 31 00 - Available Project Information.

1.07 PROTECTION

A. Dust Control: Comply with requirements specified in Section 01 50 00 - Temporary Facilities and Controls.

B. Protection:

1. Comply with general requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
2. Provide protection for walks, curbs, drains, and trees and boxing around corners of existing buildings to prevent damage.
3. Keep adjacent roads, streets and drives clear of dirt and debris from earthwork operations.

C. Underground Utilities:

1. Buried utility lines may exist.
2. If such are encountered, notify Owner Representative, Architect and District and for directions to be followed for preservation, relocation or demolition of utilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel: Excavated on-site.

1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.

B. Shoring and Bracing: Provide all materials and services necessary to properly engineer and construct shoring for excavations. Selection of materials and design of shoring, underpinning and bracing of new and existing structures shall be solely the responsibility of the Contractor.

1. Shoring design shall comply with State of California Trenching and Shoring Manual issued by Offices of Structure Construction; 2011.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify survey bench mark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

C. Upon discovery of unknown utility or concealed conditions, discontinue affected Work and notify DSA, Architect and District for direction. Unforeseen conditions shall be resolved in accordance with the General Conditions.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect above- and below-grade utilities to remain.

1. Maintain and protect existing utilities remaining which pass through Project area.

D. Notify utility company to remove and relocate utilities, as required.

E. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, and fences.

G. Remove topsoil in accordance with Section 31 10 00.

H. Excavate materials in accordance with Section 31 23 16.

I. Fill and backfill in accordance with Section 31 23 23.

3.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 1 inch in size.

C. Remove and replace unsuitable materials as specified fill.

D. Grade top perimeter of excavations to prevent surface water from draining into excavation.

1. Provide dewatering of excavations as required to ensure suitable conditions for concrete and backfilling operations.

E. Uniformly grade areas as shown on Drawings to tolerances specified in this Section..

1. Evenly grade between points where elevations are shown or between points of Work and existing grades.

F. Slope rough grade away from building perimeter at gradient indicated.

1. Upaved area slope for a distance of 10 feet from the building: Not less than one unit vertical in 20 units horizontal or 5 percent.

a. CBC Section 1804A.4.

2. When supported by soil conditions and climate; slope not less than 1:48 or 2 percent in unpaved areas.

a. CBC Section 1804A.4, Exception.

G. Make grade changes gradual. Blend slopes into level areas.

3.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

B. Slopes: Transition smoothly to adjacent areas.

C. See Section 31 23 23 for final compaction.

3.05 TOLERANCES

A. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

B. Top Surface Under Paving: Plus or minus 0.04 foot (1/2 inch) from required elevation.

C. Top Surface Under Footings and Foundations: Plus 0, minus 0.2 foot (2.4 inch).

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and raked, ready to receive work.

3.07 PROTECTION

A. Protect completed grading from erosion from weather and traffic.

B. Over-excavate and recompact areas damaged by construction activities and weather.

END OF SECTION

SECTION 32 13 13
SITE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete area paving, sidewalks, stair steps, integral curbs, gutters, parking areas, cast-in-place walls, and general site applications.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 07 92 00 - Joint Sealants: Sealing joints.

C. Section 31 22 00 - Grading: Preparation of site for paving.

1.03 REFERENCE STANDARDS

A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.

B. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ACI PRC-305 - Guide to Hot Weather Concreting.

D. ACI PRC-306 - Guide to Cold Weather Concreting.

E. ACI SPEC-301 - Specifications for Concrete Construction.

F. ACI 318 - Building Code Requirements for Structural Concrete.

G. ADA Standards - 2010 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 Asphalt Types).

Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

R. CBC - California Building Code.

S. CBC Ch. 11B - California Building Code-Chapter 11B.

T. CBC Chapter 11B - California Building Code-Chapter 11B.

U. 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 Project State 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 SPEC-301.

B. Concrete Sidewalks: 4,000 psi 28 day concrete, thickness as indicated on Drawings, minimum 4 inches, natural grey color Portland cement.

C. SIte Concrete: 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 18A and 19A.

B. Conform to California Building Code (CBC), 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 Section 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 Section 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 Section 11B-403.5.1, not interrupted by steps or by abrupt changes in level.
    a. CBC Section 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 Section 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.

D. Treads, Risers, and Nosings: CBC Section 11B-504

1. Exterior stairs shall have the upper approach and all treads marked by a stripe providing clear visual contrast.
2. The stripe providing clear visual contrast shall be a minimum of 2 inches wide to a maximum of 4 inches wide placed parallel to, and not more than 1 inch from, the nose of the step or upper approach. The stripe shall extend the full width of the step or upper approach and shall be of material that is at least as slip resistant as the other treads of the stair. A painted stripe shall be acceptable. Grooves shall not be used to satisfy this requirement.
3. The radius of curvature at the leading edge of the tread shall be no greater than 1/2 inch. Nosings that project beyond risers shall have the underside of the leading edge curved or beveled. The maximum angle for a riser to slope under the tread shall be 30 degrees from vertical. Nosings shall extend 1-1/4 inch maximum over the tread below.
4. Treads shall be 11 inches deep minimum. Risers shall be 7 inches high maximum and 4 inches high minimum. All steps on a flight of stairs shall have uniform riser heights and uniform tread depths. Open risers are not permitted .

2.03 FORM MATERIALS

A. Form Materials: As specified in Section 03 10 00, comply with ACI SPEC-301.

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. Reactive water-based silane-siloxane penetrating, water repelling sealer for use on unsealed concrete or cementitious overlays.

a. Products:

1) CONC-3 Basis of Design Product: SikaCem-102 First Seal as manufactured by Sika, or equal.

2) Sika Corporation; SikaCem-102 First Seal (Formerly Repello-FPS): usa.sika.com.

3) Substitutions: See Section 01 6000 - Product Requirements.

2. Pentrating High solids, acrylic curing and sealing compound: Minimum 25% non-yellowing, acrylic solids curing compound; shall conform to ASTM C309 and/or ASTM C1315, Type I, Class A, VOC compliant.

a. Products:

1) Laticrete International, Inc.; L&M Aquapel Plus: www.lmcc.com.

2) Sika Corporation; Scofield Cureseal-W: usa.sika.com.

3) W. R. Meadows Company; Decra-Seal W/B: www.wrmeadows.com.

4) Substitutions: See Section 01 6000 - 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.

D. Tactile Warning Surfaces: See Section 32 17 26.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-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 SPEC-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 PRC-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 SUBBASE

A. See Section 32 11 23 for construction of base course for work of this Section, where indicated on Drawings.

3.03 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.

3.04 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.

3.05 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.

3.06 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 Spacing: Space reinforcement as indicated on Drawings or in Standard Specifications, whichever is more stringent. If not indicated, maintain clear spacing of two times bar diameter but not less than 1-1/2 inch nor less than 1-1/3 times maximum size aggregate.

3. 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.

3.07 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI PRC-305 when concreting during hot weather.

B. Follow recommendations of ACI PRC-306 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.

3.08 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

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.

E. Place concrete to pattern indicated.

3.09 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.

3.10 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Medium broom, texture perpendicular to pavement direction with troweled and radiused edge.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

D. Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.11 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 1 0 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.

3.12 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.

3.13 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